FLIGHT

NORTH AMERICAN AVIATION
and Engineering Library

The AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

OCTOBER 29th, 1942

NORTH AMERICAN AVIATION, Inc.
Engineering Library

RECEIVED
NOV 27 1942
CHIEF ENGR'S
OFFICE

The de Havilland Mosquito bomber. Another British success.

★ There's a twisting track . . . there are rolling wheels . . . there's a frantic tapper . . . Though almost sunk (or countersunk!) we can draw one thread from all these clues. A tapper can tap as fast as he likes—with the right tool. And that's all that matters. Keep the wheels turning with a B. & D. Portable Electric Tapper; don't carry sleepers on your production lines. It's always:—

Quicker and better with

Black & Decker

PORTABLE ELECTRIC TOOLS

There is a wide range of B. & D. Portable Electric Tools for all purposes.

Write for Catalogue C.40

BLACK & DECKER LTD · HARMONDSWORTH · MIDDX

'PHONE WEST DRAYTON 2681/5 'GRAMS "BLACDECK," WEST DRAYTON

BRANCH SERVICE STATIONS AT BIRMINGHAM, BRISTOL, GLASGOW, LEEDS, MANCHESTER AND NOTTINGHAM

Smee's

FLIGHT and The AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

Editor
C. M. POULSEN

Managing Editor
G. GEOFFREY SMITH, M.B.E.

Chief Photographer
JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY: 8-10, CORPORATION ST., Telegrams: Autocar, Coventry. Telephone: Coventry 5210.
BIRMINGHAM, 2: GUILDHALL BUILDINGS, NAVIGATION ST. Telegrams: Autopress, Birmingham. Telephone: Midland 2971 (5 lines).
MANCHESTER, 3: 260, DEANSGATE, Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.
GLASGOW, C.2: 26B, RENFIELD ST., Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

SUBSCRIPTION RATES: Home and Abroad: Year, £3 1 0. 6 months, £1 10 6. 3 months, 15s. 3d.
Registered at the G.P.O. as a Newspaper.

No. 1766. Vol. XLII. October 29th, 1942. Thursdays, One Shilling.

The Outlook

Striking the Hot Iron

IN the great speech which Field-Marshal Smuts delivered to the two Houses of Parliament several passages stood out above the rest as specially significant. For one thing, he put the loss of Singapore into its right perspective as an "inevitable" result of Vichy's opening of the back door (Indo-China) for the passage of Japan. Secondly, he stated with assurance that the war has now changed its character from defence by the United Nations to an offensive by them, and there were other remarkable passages about the mistakes of our enemies and about the future of the world after the war.

Most pregnant of all his remarks was the following: "Once the time has come to take the offensive and to strike while the iron is hot it would be folly to delay, to over-prepare, and perhaps miss our opportunity. Nor are we likely to do so—of that I feel satisfied." Naturally, he refrained from going into tactical details, but those words obviously gave the key to the strategic advice which this great soldier and statesman is urging upon the War Cabinet.

Many enthusiasts will doubtless seize upon these words to insist, in Trafalgar Square and in the Press, that we must immediately land an Anglo-American army somewhere upon the Continent. To do so would certainly draw German divisions away from Russia, and Field-Marshal Smuts himself said that whatever help we can give Russia should be given in fullest measure and with the utmost speed. Nobody will question the necessity of that, but it does not follow that an immediate landing on the Continent would be the best way to achieve the desired result. The great South African knows all the secrets of the War Cabinet, and is familiar with the position as regards troops, shipping and air support. The point on which that whole question turns may be shipping.

The large Army which has been gathering and training in the British Isles for so long will certainly have to be used in attack when the right time comes, and, silent though the R.A.F. Army Co-operation Command remains, there are indications that when that Army moves it will have good support from the air. Its Mustangs are getting almost daily practice in attacking ground targets, and the Command now includes squadrons of Spitfires which will move forward with the Army to give general protection overhead. The terrible position of the B.E.F. in 1940, when the Messerschmitts outnumbered our Hurricanes and the Heinkels could rove almost at will over the battle area in the Low Countries and France, is not likely to be repeated. Moreover, when the time to invade the Continent comes, the whole strength of Bomber and Fighter Commands will be available to help the Army and back up the A.C. Command. A landing cannot be effected except under a most powerful air cover.

The Crucial Front

FIELD-MARSHAL SMUTS has, however, several times expressed the opinion that the Mediterranean and its shores are the really crucial front in the struggle with Germany and Italy. That the Axis is very nervous about that front is shown by the renewed fury of its attacks on Malta, attacks which this time have done little damage and have cost the enemy scores of aircraft and their crews. Either a decisive victory or a decisive defeat in the desert would have immense consequences for both sides.

There were doubtless good reasons why General Alexander stood on guard for so long, but now at last he has struck. He has prepared, but he has not over-prepared, and he has not missed his opportunity. In Egypt the British have what they have not got else-

where, an Army thoroughly experienced in fighting over its own particular terrain. Above all, there is now a degree of unity in purpose and in action between the land arm and the air arm which has not before been worked up in any other theatre of this war.

Sir Roy Fedden

THE aviation world in general and the British aircraft world in particular learned last week with something like a shock that the long association of Sir Roy Fedden with the Bristol Aeroplane Company, Ltd., has come to an end.

The company has merely stated the bare fact, and Sir Roy has remained silent except for a brief note to the Press in which he pointed out that he had not resigned. Consequently one has no means of knowing what events led up to this tragic decision, for tragic it is from the national and personal point of view.

During the 22-year period in which Sir Roy was chief engineer of the Bristol engine department that company's aircraft engines have won world-wide fame, and justly so. Not only have Bristol engines powered large numbers of British commercial and service aircraft types, but several foreign nations thought so highly of them as to acquire licences to build them. The excellent workmanship of the Bristol shops, coupled with clever design, formed a foundation on which the very highest reputation was built. Bristol led the world in the development of sleeve-valve engines, and what that has meant to the nation, and will mean in the future, cannot readily be over-estimated.

While thus the world showed its appreciation of Bristol aircraft engines by buying or building them in large quantities, the originator of them was honoured personally by many distinctions conferred upon him by Great Britain, America and Germany.

Sir Roy Fedden is himself a tremendously hard worker, and he expects those under him to give of their best as unstintingly. His fame has not been established without effort, but it *has* been established, and it is unthinkable that a man with his qualifications and experience could be cut off from further participation in the national effort in the middle of a war, nor do we think that at all likely to happen.

CONTENTS

The Outlook	459
War in the Air	461
Here and There	464
War Artists' Exhibition	465
The De Havilland Mosquito	466
Topics of the Day	468
Composite Non-such—No. 1	469
Behind the Lines	470
Aircraft Characteristics	470, a and b
Photography While You Bomb	471
German "Outsiders"	472
Cologne Raid V.C.	474
Plastic Progress	475
Engineer Officer's Day	478
Correspondence	480
Service Aviation	482

RUSSIAN AIRCRAFT OUTPUT: Production lines of I.26 low-wing fighters in one of our Allies' war factories. These I.26 fighters still have a claw fitted to the airscrew for positive starting.

War in the Air

Boeing B 17Es of the United States Army Air Force in Britain taxying up to the take-off point.

Daylight Bombing : Furious Work in the Middle East : The Pacific Position : Hampdens Drop Torpedoes

TIP-AND-RUN raids by single German aircraft or by pairs have lately been frequent, and usually the raiders have contented themselves by poking their noses over the coast, getting rid of their bombs on the nearest town, and then turning to fly for their lives. Sometimes they do not save the said lives, for occasionally Spitfires or Beaufighters get on their trail and hunt them to the death. Many stories are told of exciting chases in and out of clouds up to near the coast of the Continent, before the avenging British pilot gets in the burst of cannon shells which sends the German down into the Channel.

British pilots can also go out singly in daylight with bombs, and when they do they do not stop at coast towns; they press on inland. The first instances of the sort which were made public concerned Wellingtons, but lately Mosquitoes have been the chosen instruments. It is very hard for ground defences to deal with very fast bombers which fly low. Airfields are very suitable targets for bombers using such tactics, as they cannot be defended by balloon cables, and there is nothing to prevent the invading bomber from keeping low.

Another type which has been intruding by day is the Mustang, the tactical reconnaissance type of the Army Co-operation Command. Part of their duties when the great land battles start will be attacking ground targets, and it is a very good thing to give them plenty of practice against the enemy when no Army operations hang upon the success or failure of their efforts. So Mustang squadrons have been out machine-gunning and dropping light bombs on various targets in France and Belgium on many occasions of late. On October 21st the Mustangs made R.A.F. history by penetrating right into Western Germany. The border of Germany and Holland is some 300 miles from London, so the round trip was a great tribute to the Mustangs' air endurance. They machine-gunned a military camp from tree-top height, and got as far as the Dortmund-Ems Canal, where they shot up some barges.

In Russia

LAST week it almost looked as if things were really desperate for the Russians in Stalingrad, but once again a recovery was brought about by the magnificent gallantry of the Russian soldiers. The Russian has always had the reputation of being unsurpassed in defence of a really nasty position, sharing that reputation with the Anatolian Turks. This does not merely imply a readiness to die at his post, for a position cannot be held by dead men who have been exterminated by shells and bombs. It means that Russian leaders have a real gift for seeing instantaneously how to defeat an attack which at first seemed to be overwhelming. Moscow radio has recently stated that Soviet pilots were holding an umbrella over the Red infantry in Stalingrad. That seems to signify that new squadrons of fighters have been brought up to help in the defence of the battered city, and have been disputing the German mastery in the air. The German dive-bombers have been pounding away at the buildings held by the Russian infantry, and have paid special attention to the artillery positions. The latter arm, so far as can be judged at this distance, has been the chief weapon of the defence when the German panzers have advanced to the attack, and if the gun-

RAISING A DUST: Bostons taking off from a Western Desert airfield.

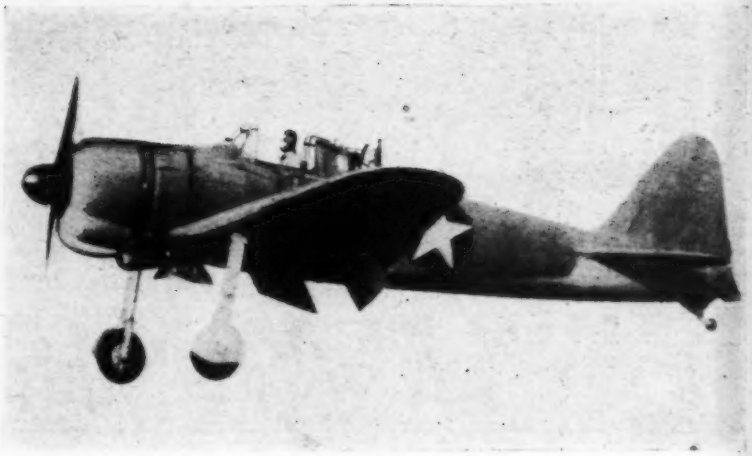
WAR IN THE AIR

ners can be protected from the dive-bombers the Russian prospects will certainly be brighter. But the ultimate result of this unprecedented assault and unprecedented defence cannot be foretold.

An Air Crescendo

THERE have been signs of approaching winter in Northern Africa and the nights have been getting cold. That indicates that the weather is suitable for desert campaigning, and both sides are getting ready for it. The sudden renewal of Axis bombing attacks on Malta showed that Rommel was anxious to get his supplies through without interference from the bombers and torpedo-aircraft based on the island. Thanks to the magnificent work of the island's Spitfires, these attempts by the Axis to bottle up Malta resulted in such appalling losses, and very little damage to the airfields in the island, that a halt had soon to be called. The majority of the raids were met out at sea, and most of the Axis bombers had to jettison their bombs without crossing the coast. The Spitfire losses have been very small.

At the same time, Sir Arthur Tedder's squadrons have worked up to a positive fury of attack on the Axis airfields, communications and harbours in Libya, as well as striking at convoys and bombing airfields in Crete, Rhodes and other islands occupied by the enemy. Tobruk has been regularly bombed every night for some time past, and much shipping in the harbour has been destroyed. Some supplies get through, none the less, though a number of convoys have made for Tripoli as a safer port, although that has meant running the gauntlet near Malta, and in spite of the distance between Tripoli and the battle front at Alamein. All this must surely show that Gen. Montgomery has something in mind. Any day now the world may learn what it is.

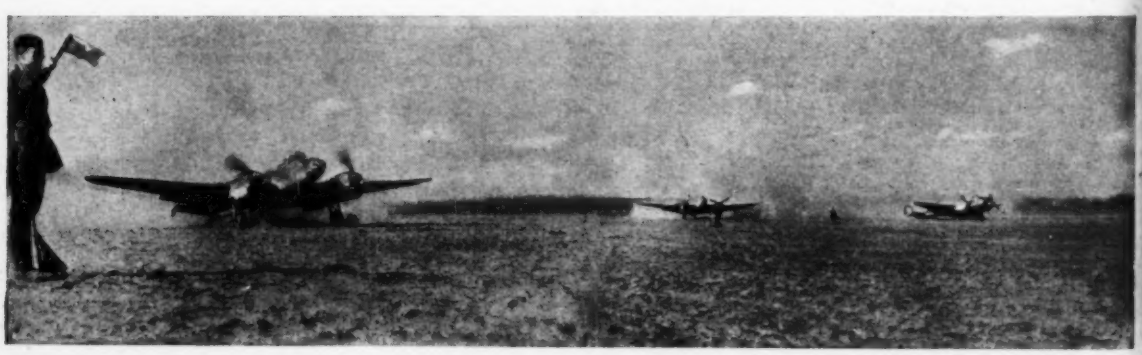


TAIL DOWN JAP: A captured and reconditioned Japanese Zero fighter being test-flown by Lt. Cdr. E. R. Sanders at San Diego. The Zero was shot down in the Aleutians.

The Pacific

A TENSE situation has also grown up in the South-West Pacific, and it may develop into a first-class battle at any moment, perhaps even before these words are published. While the Australian troops pressed forward over the Owen Stanley mountains in New Guinea, outflanking and driving back the Japanese wherever they have come up with them, the enemy has been massing his strength for a great attempt to dislodge the Americans from their positions in the Solomons. The greatest prize is the airfield in Guadalcanal, and the Japanese have succeeded in landing reinforcements on the island. They have done so under cover of strong naval forces, including battleships. So far as is known, the Americans have no battleships in that area, and they have lately suffered heavy losses in cruisers. It has been impossible for them to risk a fleet action, and their counter-measures have been confined to incessant raids by their heavy bombers on the Japanese fleet and troops. Fortresses have scored many successes, and are believed to have damaged a Japanese battleship. Rabaul has also been regularly plastered. Army troops have been landed in Guadalcanal to strengthen the Marines already there. The important airfield mentioned above has been shelled from the sea, and that has an ominous sound. Nobody has ever denied that, within their range, shells are more potent than bombs, not perhaps missile for missile (a shell of 8,000 lb. or 4,000 lb. is very potent), but because gunners do not have to make a new "bombing run" for each discharge, and their store of ammunition is generally inexhaustible for ordinary battle purposes. But we British have learnt, from our experiences at Stavanger and elsewhere, that neither shelling nor bombing can easily put a well-organised airfield out of action.

The American and Australian bombers have ranged far and wide, for the Japanese have occupied great numbers of islands. For instance, recently Hudsons made a daylight raid on a place called Maobisse, near Dilli, in Portuguese Timor. Hudsons are suitable for such rather minor operations, while the heavy bombers,



TWIN-ENGINED RUSSIANS: P.E.2 bombers of the Russian Air Force taking off from an advanced airfield on the North-West front.

WAR IN THE AIR

Fortresses and others, are the best weapons available for doing damage to the Japanese fleet.

The Desert Offensive

THE action adumbrated on the preceding page has begun. For nearly a week the Allied air forces with the Eighth Army hammered the Axis in the desert, while British submarines in the Mediterranean worked all out to reduce Rommel's supplies. Bomber Command lent a hand by a series of raids on Genoa and other places in northern Italy from which Rommel often gets supplies. Then, on Friday night, October 23rd, in bright moonlight, the British artillery opened a terrific bombardment on the Axis positions, and the infantry advanced.

Just before this attack was launched General Montgomery, G.O.C. Eighth Army, told Press correspondents: "In this battle the Eighth Army and the air forces supporting it are one. They are both operating on one set plan and not two—one for the land arm and one for the air arm. In this, I believe, lies their great strength. I have always maintained that we are one fighting force."

Heavy as was the air action on the Friday and previous days, on the Saturday the fighting British troops saw the sky over the desert filled as never before with innumerable squadrons of fighters and bombers, R.A.F., S.A.A.F. and American, sweeping forward to the attack. So thoroughly had the enemy's airfields been plastered in the preceding days that very few Axis aircraft were available to take the air in opposition. On the Friday our fighters had destroyed eight of them, but on the Saturday they were only able to account for one—which tells its own tale.

BRITISH & U.S. AIR LOSSES TO OCT. 24th

	Over G.B. A'crft.	Over Continent B'brs.	Over Continent F'trs.	Middle East A'crft.
Oct. 18	0	0	0	1
,, 19	0	0	0	2
,, 20	0	1	0	12
,, 21	0	0	0	3
,, 22	0	0	1	6
,, 23	0	4	1	4
,, 24	0	8	0	12
	0	13	2	40 (9 pilots & 2 b'br. crews safe)

Totals: West, 4,796; Middle East, about 1,820.

Long-range Fighter: A Beaufighter pilot in a dispersal tent on an Egyptian airfield. In the background his machine is ready for immediate use.

Italian Supply Ports Raided

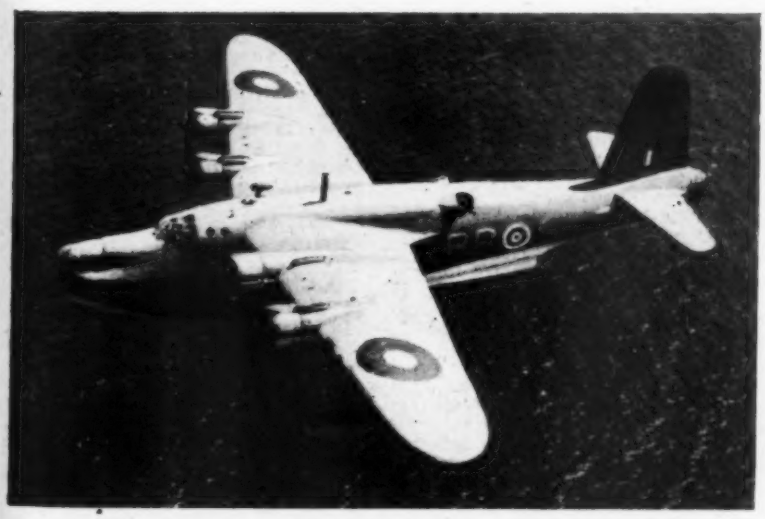
MUCH of the material which Rommel needs has lately been shipped from Genoa. It is a long flight from the Egyptian air bases to that port, and the Middle East bombers were all busy on targets closer at hand. So Bomber Command undertook the task of interfering with Axis arrangements in northern Italy. On the night of Thursday, October 22nd, a large force of bombers flew from Britain over banks of clouds, which cleared as they reached the Alps. Genoa soon lay beneath them in the moonlight, and they attacked their targets with bombs of 1,000 and 4,000lb. calibre. The docks were one of their main targets, and these were heavily damaged. Factories also got their dose of medicine, and an experienced observer said that he had never seen such fires, even at Lübeck and Rostock. Next night Bomber Command visited Italy again, and this time raided Genoa, the smaller port of Savona, and Turin. The weather was not so good, but further damage was done. This time a few bombers were lost. Yet this did not satisfy Bomber Command's desire to help the Eighth Army. On Saturday, in daylight, while Gen. Montgomery's men were fighting furiously in the gaps through Rommel's minefields, a large force of Lancasters set out from England and flew to Milan. Fighters escorted them into France, and then they had to trust to their own abilities, keeping close formation and "hedge-hopping" towards their goal. Bombs of 4,000lb. were dropped on factories, mostly from a very low altitude. There has been only one longer daylight raid by bombers, namely, that to Danzig, but this was the longest daylight raid over enemy territory. Three Lancasters were lost.

Meantime all the Home Commands have been busy nearer Britain, hitting out in their several ways. One is the use of Hampden bombers as torpedo-carrying aircraft.

ENEMY AIR LOSSES TO OCT. 24th

	Over G.B.	Over Continent	Middle East
Oct. 18	0	1	3
,, 19	1	0	3
,, 20	0	0	11
,, 21	1	0	4
,, 22	0	0	10
,, 23	0	0	11
,, 24	0	0	4
	2	1	46

Totals: West, 6,437; Middle East, over 4,793.



SECOND MARK BOAT: A Sunderland II on anti-submarine patrol.

HERE AND THERE

Ceylon Buys a Fighter

THE sum of Rs. 100,000 (approximately £7,500) has been raised by the Automobile Association of Ceylon for the purchase of a fighter aircraft for the R.A.F.

R.A.F. to Get 170,000 Bicycles

SIX bicycle manufacturers will complete next month the delivery of 170,000 standard machines for use on airfields.

Pilots, among others, will use them to cycle to and from their aircraft and so save petrol. A proportion of the new machines are painted white for safety in the black-out.

Bomber Command Congratulated

THE following message has been sent by the Secretary of State for Air, Sir Archibald Sinclair, to Air Chief Marshal Sir Arthur Harris, A.O.C.-in-C., Bomber Command.

"I am desired by the War Cabinet to convey their congratulations to you and to the officers and men under your command, who planned and carried out the successful attack upon the armament works at Le Creusot.

"The skill and daring with which this great daylight raid was planned and executed, and the weight of the blow which you have struck against German war production from occupied France, are fully appreciated by the Government."

Slow, but Sure

NEWS that the Russians have been using light trainer aircraft for the night bombing of German positions at Stalingrad is a reminder that, at the time of Dunkirk, when we were hopelessly ill-equipped to meet the expected invasion, our own Tiger Moths and Maggies were hastily fitted with bomb-racks to help cope with the expected emergency.

According to reports, the Russian trainer-bombers achieve considerable accuracy by virtue of their slow speed, but nothing has been said, so far, about their own casualty rate.

SIR ROY FEDDEN. After a period of 22 years as chief engineer of the engine department of the Bristol Aeroplane Company, Ltd., during which have been produced some of the world's finest aircraft engines, Sir Roy has had to relinquish his post. Editorial comment on this amazing occurrence will be found on page 460.

Fund's New Chairman

LORD RIVERDALE has been appointed chairman of the R.A.F. Benevolent Fund in succession to the Duke of Kent.

The fund has already raised more than £2,000,000 since the war began. Its present target is £6,000,000, and among recent useful contributions from abroad are sums of £500 from the people of British Guiana and £374 15s. allocated from the Gold Coast Fund for War Charities.

Feline Flight

"KITTEN became air-borne at 14.30."

This mysterious entry in the deck log of H.M. Destroyer *Gorleston* is a record of the strange adventure of the ship's mascot.

The kitten, Rastus, is a daughter of the blitz, having boarded the destroyer at the height of an air raid ashore and made herself at home on board. In harbour her favourite pastime is stalking seagulls on the fo'c'sle.

Recently, having carried out a successful surprise attack, Rastus was seen to take-off clinging to the leg of a large gull. As the bird circled Rastus fell into the sea, swam ashore and returned to the ship by way of the pier and gangway.

A.T.C. Cadet Joins Fighting French

THE first A.T.C. cadet to join the Fighting French Air Force is now learning to fly at a Flying Training School in this country.

He is Cadet "R," and was formerly a member of No. 97 Norbury Squadron.

Born in Paris eighteen years ago, where he lived until he was sixteen, he got away from Bordeaux in June, 1940, when the Germans overran France. Making his way to England, where his uncle lives, he tried to join the Free French or the Royal Air Force, but was turned down as too young.

Desperately keen to do something to avenge his country, he did the next best thing and joined the Air Training Corps. As he says, he always wanted to be a pilot, and the A.T.C. set him going.

Transatlantic Air Mail Service

THE Postmaster-General announces that, owing to the weight of the traffic, difficulty is from time to time experienced in arranging for the conveyance by air across the Atlantic of air mails for Canada, the United States of America and beyond, and that on occasion such mails have to be sent by sea.

It is important in the general interest that the transatlantic air mail service should not be used for other than the most urgent correspondence.

A WIZARD IF EVER THERE WAS. Professor George Constantinesco, the man who, in 1916, gave the R.F.C. the advantage of the interrupter gear, enabling a machine-gun to fire through the airscrew disc and so interrupt the careers of far more Hun airmen than previously, has more than 150 inventions to his credit at the Patent Office. A Rumanian by birth, but a naturalised British subject, he is now, at the age of 61, said to be at work on a motor torpedo boat of phenomenal performance.

Spirit of Youth

THE recent story of the 16-year-old enthusiast who borrowed a Tiger Moth and made a successful circuit and bump without ever having had so much as a single flying lesson is just the sort of episode which helps to maintain one's faith in our younger generation.

Not that we wish to encourage other similarly situated young men to go and do likewise, for in nine cases of out ten such an adventure would inevitably end in calamity.

But in this particular instance it demonstrated not only courage and self-confidence, but the ability to keep calm in a situation the perils of which must have been fully realised.

Good show, laddie—but don't do it again!

Bomber's Tyres Weigh 8 cwt.

THE two tyres of a big bomber now weigh close on 8 cwt.

"How astonished J. B. Dunlop would be to see the vast tyres, weighing nearly 440 lb. each, which are made for the largest British bombers to-day," said Sir George Beharrell, the Dunlop chairman, in a recent Empire broadcast, "The Pneumatic Tyre."

"Perhaps he would be even more astonished at the single-tube racing tyres which were made just before the war, some of which weighed no more than 4½ oz."

WAR ARTISTS' EXHIBITION

Recent Additions to the National Gallery's Collection of War Pictures

IS the ghost of chivalry dead, or does it, even in these days of double-crossing and mass murder, still live in the hearts of free people?

This question, I think, can best be answered by a visit to the Exhibition of New War Pictures, which was opened last week at the National Gallery in London. Composed entirely of the work of official war artists, the pictures show many aspects of the present struggle. Some are fine impressions of life in the Middle East, some depict miners working in the pits, some give a lasting record of the war at sea, on the home front and, of course, in the air.

Notable amongst the latter are the last efforts of the late Eric Ravilious, who was recently killed in aerial combat while searching for material under actual battle conditions. His interpretations of Spitfires at daybreak, a scene in an R.A.F. Mess, and "Elementary Flying Training," in which a Tiger Moth is shown taking off with a pupil, are splendid examples of the artist's own particular style. "Corporal Steddiford's Mobile Pigeon Loft" was also much admired, though the subject was by no means an easy one.

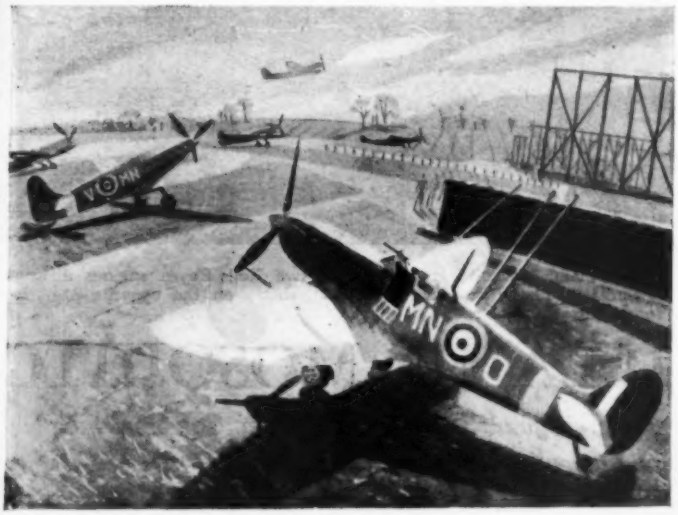
Eric Kennington's pastels of flying personnel are strongly represented, and many famous "aces" watch silently over the scenes of past glories. "Old Kut" and his friend, Squadron Leader McLachlan, D.S.O., especially caught my eye.

Perhaps the most original exhibits are those by R. V. Pitchforth depicting the more neglected, but most important side of flying, the "works." Here I saw a vivid study called "Fired-out Engine," showing the smouldering remains of a radial engine after a crash. A scene showing mechanics at work on a Bristol Hercules engine, and several impressions of damaged airscrews awaiting repair, complete the collection of Pitchforth's water-colours, proving that art can quite easily be applied to things mechanical as well as animated objects. One gathers from pictures like these the great part played by the ground staff, who mend, service, and keep the aircraft in the air.

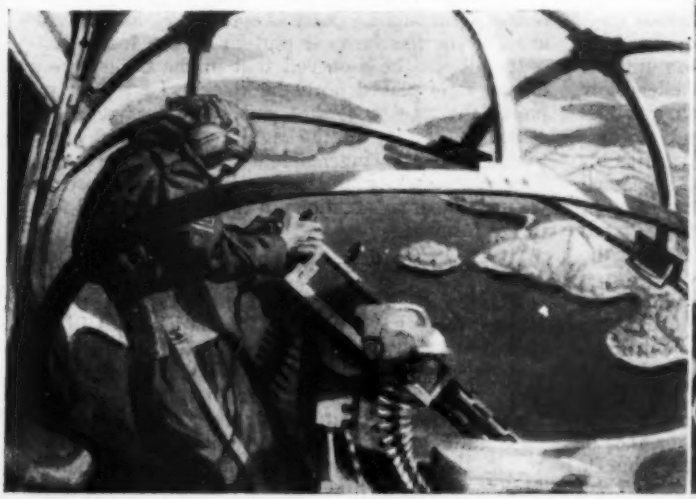
Equally vital work is done in this direction by the W.A.A.F., and in the Exhibition their task is not forgotten. Dame Laura Knight pays tribute with an oil painting, "In For Repair," which typifies the spirit of the Corps. W.A.A.F.s are shown mending a damaged balloon, while the shades of evening creep up behind them. They must hurry or night will fall before they finish.

In "The Cat Blister," also, Christopher Perkins has captured the excitement that lives in the turret with the air gunner.

P. J. B.



"Spitfires—early morning" by the late Eric Ravilious.



In "The Cat's Blister" by C. Perkins.

"Flt. Lt. Kuttelwascher" by Eric Kennington.

OUR NEW RECONNAISSANCE BOMBER: The De Havilland Mosquito is powered by two Rolls-Royce engines driving De Havilland three-bladed hydromatic airscrews. Its similarity to the De Havilland Comet, shown on the opposite page, is somewhat remarkable.

THE DE HAVILLAND MOSQUITO

Our Latest Reconnaissance Bomber : Logical Development from Comet Which Won England-Australia Race in 1934

SOME weeks ago the Germans announced on their radio that they had brought down a new British aircraft type, the Mosquito. Official reticence prevented the British Press from making any mention of the existence of the new machine, and it was not until the daylight raid on Oslo that the name of the new type was divulged officially. Since then the Mosquito has figured several times in the war news, and it has now become possible to refer to it and to publish an illustration.

Designed and built by the De Havilland Aircraft Co., Ltd., the Mosquito shown in our photograph is classed as a reconnaissance bomber. It is, as the picture shows, a remarkably clean machine, with the wing placed approximately half-way up the fuselage sides, and the two Rolls-Royce liquid-cooled engines underslung from the wing in such a way as to leave a very smooth surface where the top of the engine nacelles merges into the upper surface of the wing. This is an arrangement which has been found (in the Avro Lancaster, for instance) to give very low drag, as the airflow over the top of the wing is but slightly disturbed by the power units.

Readers who remember the England-Australia race of 1934 will be struck by the similarity between the De Havilland Comet which won that race (piloted by C. W. A. Scott and T. Campbell-Black) and the new Mosquito. The Comet was a low-wing monoplane, whereas the Mosquito is a mid-wing, but that change is, of course, easily explained by the fact that the new machine has to carry bombs housed internally, whereas the Comet, designed for the greatest possible range at the highest possible speed, had its petrol tanks installed in the forward portion of the fuselage.

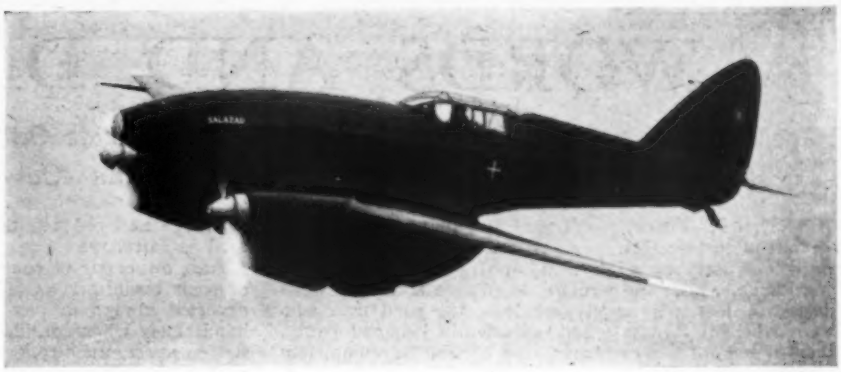
It will also be observed that in the Comet the crew of two were placed fairly far back. That position impaired the view somewhat, but was necessary to get the centre of gravity in the right position, and could be tolerated in a racing machine. In a military aircraft, very different considerations obtain, and consequently we find the crew's stations in the Mosquito well forward in the fuselage.

Aerodynamic Cleanness

Bearing in mind the operational functions of the two types, which have resulted in the changes in outline design mentioned, it is quite obvious that the Mosquito may be regarded as the logical scaled-up development of the Comet. It is, therefore, natural to assume that the aerodynamic cleanness of the racing machine finds its counterpart in the military aircraft, and that, as a result, the Mosquito is very efficient aerodynamically. If that be so in actual fact (and external visual evidence gives good grounds for the assumption), the low drag can, of course, be utilised in two ways: to give very

high speed or very long range, or possibly a combination of the two.

In this connection it is not without interest to recall a conversation which *Flight* had with Capt. Hubert Broad, who was at that time De Havilland's chief test pilot. Broad's argument was that, with a few relatively simple modifications, the Comet could be turned into a very useful bomber. He suggested that some of the petrol capacity be sacrificed (the Comet carried 258 gallons of petrol) and that a single large bomb be carried instead, with the crew reduced to one man, the pilot. The fuel weight of the Comet was something like 1,800 lb. If that were reduced by 500 lb. for a bomb, the machine would still, with one member of the crew "jettisoned," have available 1,500 lb. of petrol, or something like three-quarters of its racing range, which was not far short of 3,000 miles. So that a Comet bomber would be able to carry a 500 lb. bomb to a usefully distant target. The "one-man-one-bomb" idea was not adopted by the authorities, but it is interesting to recall that the suggestion was made eight years ago, almost to a day.



"Flight" photograph.

FROM RACING TO RECONNAISSANCE : The De Havilland Comet (two 230 h.p. Gipsy Six R engines) won the England-Australia race in 1934. It had a speed of about 230 m.p.h. and may be considered the forerunner of the new Mosquito, allowing for changes due to the difference in operational requirements.

Cheap Speed

The speed of the Comet was about 230 m.p.h. with two De Havilland Gipsy Six R engines of some 230 h.p. each. That does not appear very high now, but it was far higher than the speed of any bomber we had in 1934, and the Comet could have been built in great numbers at very small cost. It was even "modern" to the extent of having variable-pitch airscrews (Ratiers of a somewhat primitive type, which could not be returned to fine pitch once they had been put into coarse).

The engine installation in the two types is very similar, allowing for the fact that the Mosquito has Rolls-Royce liquid-cooled engines of far greater power, while the Comet's engines were, of course, six-cylinder, in-line, air-cooled. The photograph reveals the manner in which a clean exterior has been preserved in the Mosquito in spite of the need for radiators. A somewhat similar arrangement is used in the Westland Whirlwind fighter.

So far as the undercarriage is concerned, the Mosquito is even "cleaner" than the Comet, for its tail wheel retracts as well as the main wheels, while the Comet had an exposed tail skid.

In the plan form of the wings there is also considerable similarity; both are heavily tapered, although the wing tips of the Mosquito are not quite so pointed as were those of the Comet. It may, perhaps, be recollected that the Comet had the thinnest pair of wings seen on any cantilever monoplane at that time. The necessary strength was obtained largely by the use of a special form of wood construction, in which narrow strips of spruce were laid diagonally across from leading to trailing edge, the number of layers being increased towards the root, where the stresses are greatest. In this connection it is interesting to record that the Mosquito is also of wood construction. Apart from the very smooth exterior, without stress wrinkles, which this form of construction can give, there is the further advantage that it makes possible a very wide dispersal of manufacture. That applies not only to home manufacture but to manufacture overseas. For instance, it has been officially announced that the Mosquito is being built in Canada. Since the supplies of suitable timbers are found in that part of the world, there should be a great saving of shipping space.

So far as the fuselage is concerned, that of the Mosquito is, perhaps, slightly more "refined" than the Comet's in that the sides are more rounded. The overall form may, however, be less good, due to the fact that crew's cockpit roof makes a more pronounced break in the contour, and is placed farther forward. The optical flat in the bomb-aimer's station may also be assumed to offer more drag than the landing light, which formed the point of the fuselage in the Comet.

Scaling-up

Mention has been made of the fact that the Mosquito may be regarded as a scaled-up version of the Comet. The scale may be judged from the overall dimensions. The Comet had a wing span of 44ft. That of the Mosquito is 54ft. 2in. The length of the Comet was 29ft., while that of the Mosquito is 40ft. 9½in.

Of the performance of the Mosquito nothing may be said, but it should not be difficult for anyone interested to make a fairly good guess from the data of overall size and the power of the engines. That the machine is very fast indeed is quite obvious. The enemy has already had some evidence of its striking power as a bomber, and the offensive armament may consist of four 20 mm. cannon and four 0.303 machine guns, so that the Mosquito is evidently a type which is destined to play a very important part in the war during the months to come.

The De Havilland Aircraft Co., Ltd., has always specialised on civil aircraft. The Mosquito is the first operational type to be produced by the firm in this war, and Capt. G. de Havilland, Mr. C. C. Walker and their team of technicians are to be congratulated on having in this way stepped into the very front rank with a military type which is particularly offensive.

The photograph of the Mosquito which appears on the opposite page was specially taken by our chief photographer, Mr. John Yoxall, for universal distribution to the world's Press.

Our front cover illustration of the same machine is printed direct from a colour photograph also taken by Mr. Yoxall.

Topics of the Day

WORDS AND DEEDS

Preparing for a Better To-morrow : State Control or State Ownership for Airlines? : Subsidising Inefficiency : Educating the "Little Man" Out of Parochial Ideas

PERHAPS it is not so extraordinary that words so often tend to lose their original meanings. The power of "natural" (as opposed to forced) propaganda is fairly considerable, and, furthermore, handsome is as handsome does. If, fifteen hundred years ago, the good men who were labelled "Saints" had consistently behaved badly, then the word's present meaning would be completely different. But most of the altered words have, in fact, lost their genuine meanings through what I am pleased to call "natural propaganda."

What kind of picture, for instance, does the word "Suffragette" produce in the minds of those old enough to remember the word at all? Probably that of a wild-eyed, dishevelled female chained to some railings, or a tough, hatchet-faced woman hurling stink-bombs from the gallery of the House of Commons. Yet the word could quite as easily describe a quiet, good-looking and intelligent young person who was merely advanced enough to think that women should have an equal right with men to arrange the world in which they had to live.

Again, a "Communist" is not necessarily a person who would forcibly tear the existing world apart, taking from those who "have" and giving, without regard to sense and order, to the many who "have not." He or she may merely be a person who believes in a system of all for all, and who is sufficiently out of touch with horrid reality to believe that Smart Alecs and Go-Getters can be instantaneously educated out of their bad habits, or that everybody could be encouraged to work without the incentive of worldly gain. In very, very small type, one might almost add that Communism *could* be the practical application of Christianity—if this was a world in which everybody could be trusted to behave rationally and fairly to his or her fellow-creatures.

State Control

One can think of dozens of similarly refashioned words; I have merely picked two extreme examples. If you want one working the other way, you have only to think of "Conservative." If you accused somebody of being conservative in these days you would be as good as telling him that he was an old-fashioned dead-beat; but nobody is in the least disturbed by the label Conservative (with a capital "C"), because the party of that name may, at any particular moment, be far more progressive and reasonable than any other.

Less marked, but still noticeable, are the average person's reactions to such expressions as "Controlled Private Enterprise" or "State Owned." They cause both snub and patrician nose to wrinkle. I know that, to me, the first expression savours of compromise, and the second of nine-thirty to four-thirty inefficiency. The result, perhaps, of previous experience of such things, when "control" has merely tied the hands of private enterprise and prevented it from doing just the things it is really good at doing, and when the "State" has consisted so largely of half-baked time-servers who have been interested only in the regularity of their incomes and the safety of their jobs.

Private enterprise *does* inevitably produce results, but it is liable to run away with itself and, unchecked, can produce the most unpleasant results both for me (as the ordinary person) and for the enterprising people themselves; it is not much good building an amazingly efficient factory to make private aircraft at a low price if nobody has any money to spend—because the purchasing power has gone into this and other factories or because somebody else, in a very enterprising mood, has juggled with the exchange and reduced the value of the chits which are used as currency.

State ownership or control is necessary for the operation of such businesses as airline concerns which cannot be expected always to pay for themselves, but which pay handsomely when considered in terms of the prosperity of the entire community. And, given the right people in charge, there is no earthly reason why even a State-owned concern should not be efficient. Provided he is interested and feels that his job is an important one, the average person will always work extremely hard, regardless of his income. But he *must* have some incentive—whether cash, honour or interest.

Public Utility Airlines

One of the most significant facts in the history of commercial development during the two decades before this war was that "capital" could not easily be found for air transport enterprises. No direct and unreasonably large returns could in any case be expected from them, and the bankers and brokers consequently fought shy. Therein lay an example of the weakness of private enterprise when it is left entirely to itself; the "every man for himself" system fell down when the returns were going to be spread over the whole community. The go-getters are not particularly good at casting bread upon the waters—and why should they be expected to be? Only when a subsidy was promised—or (in the case of more daring speculators) when, after careful lobbying, it could reasonably be expected—were the Big Shots interested.

The word "subsidy" stinks to high heaven and should never again be used. It has become a description of the sort of thing that is parsimoniously doled out to feeble key industries until such a time as these have managed to pull themselves together and come into the money. In my opinion, airlines will never "come into the money" unless they are considered as national and international enterprises for the good of the community as a whole. Nobody expects the police force to pay for itself (though some motorists used to wonder whether it did); nobody expects a solid cash return for medical research; nobody expects a profit from a dam or a reservoir; and certainly nobody expects a profit from a good long war. But the returns are not quite invisible—they are spread over the whole business community.

Post-war Effort

If the Anglo-Saxon races had put as much productive effort (I don't care to use the dated word "capital") in a year of airline organisation as they are now putting into a week of this war, some real and tangible results would have been achieved. Experience has shown that this air transport business is one of those in which only really large outlays can produce complete results. The ground organisation must be on a gargantuan scale before the thing can be run with sufficient regularity and safety to be attractive; then you can begin to think of smaller profits and quicker returns.

The international airline of the future will be like a wartime air force—cost and effort must not be counted until the results have been achieved. It is just not possible to run a long-distance air service on parochial lines with scratch equipment. The air base at, say, M'Pingo must be as proportionately well equipped as that for London, and the feeder services must have machines as good, in their own way, as those used on the main line. There must never be a repetition of the days when an important

WORDS AND DEEDS

long-distance machine was held up in the Middle East for a week while a spare engine was flown from somewhere else and painfully installed with inadequate facilities; or of the days when hopelessly outclassed, out-of-date and ill-equipped machines were used for the most difficult night air service in a Europe renowned for its indifferent weather.

We have seen what the British aircraft industry can do when it is given the encouragement and incentive. Let there be no more nonsense of the "no suitable machines" or "no time" or "no money" kind when this war is over. Whether the world airline system is run by different State-controlled private companies in competition, or whether the whole thing is a pooled and internationally controlled affair doesn't matter a great deal. The traveller flew about Europe and the world in the days of peace without bothering very much about the nationality of the company or, least of all, about the nationality of the manufacturers of the machine in which he was travelling—just as he sailed quite happily in British, American, Dutch, French and German boats.

Non-flying Bureaucrats

Those of us who travelled about Europe—and even more so those who travelled about the world—by air in the years between 1934 and 1939 could not fail to be impressed by the disproportionate efforts and expenditure on airline systems of quite comparatively small and poor countries. Speaking generally, the differences merely meant that the Powers in these smaller countries had the courage of their convictions, whether right or wrong. Possibly there is no need to mention courage, since sufficiently strong convictions will always provide the necessary drive.

I'm afraid that our own bureaucrats had neither the convictions nor the courage. Perhaps they didn't like flying or believe in it. At any rate, the money, whether in terms of a "subsidy" or otherwise, was not forthcoming, and even our national airline, with most of the world to cover, struggled along with inadequate facilities because the mentality of the Powers was of the small shopkeeper order. Either they should have said, in effect, "We don't believe in the future of air transport and it must stand or fall on ordinary commercial lines," or they should have gone all out to make it worthwhile. At the time the fact wasn't much commented on, but the adverse propaganda effect of the arrival of our Prime Minister at Munich in 1938 in an American civil aircraft must have been immense. It would have been better if he had turned up in a prototype bomber.

And there's another word for my list:— "Bureaucracy." I don't know, for instance, what word the Swedes use to describe this thing, but in pre-war years bureaucracy in that country meant the proper organisation of all manner of things, from airlines to education. In this country, as long as we can remember, it has meant a kind of bowler-hatted, conservative and unimaginative organisation of sometimes futile restrictions. It has meant restrictive rather than constructive legislation.

"Indicator's" Little Man

Maybe the person epitomised by Strube's Little Man—that mean-minded, conventional, worried and harassed fellow—has deserved nothing better than a world in which miserable little taxes on minor luxuries are easily paid and are better understood than a general reduction of incomes. The Little Man will grumble like mad but will still pay some ridiculous and complicated sums on his consumption of tobacco or alcohol or petrol (while retaining his paper income of £1,000 a year) rather than be paid less. Bureaucracy, with its black-out technique, has certainly deserved its meaning here, but there is no reason why the word shouldn't conjure up a totally different picture of a properly and happily organised community run by rational and highly educated enthusiasts.

Let no one imagine that the Little Man is a fauna indiginous to this country. If he had been, the rest of the world would have reorganised itself in such a way that we wouldn't have had a leg to stand on. He pops up everywhere, whether covered in stupid little uniforms and phoney medals in Germany, or carrying his umbrella and attending a meeting of the Watch Committee over here. He is the reason why this country was so unprepared for action in 1938; why Germany found a scapegoat in the Jewish and Leftist minorities; why America suffered a slump ten years ago; and why the French lacked the will and the concerted energy for resistance in 1940. But for him the British airlines would have been the best in the world.

He is obstinate, he is ignorant, he is fifty years behind his times—but he is as brave as a rat when he is defending his rights and privileges. Direct his imagination into the proper channels and he will be magnificently immovable in the defence of human rights and liberties; leave him alone and he will merely look after his little shop, paying off the racketeers with a feeble shrug.

To-morrow must not be allowed to be merely another day.

"INDICATOR."

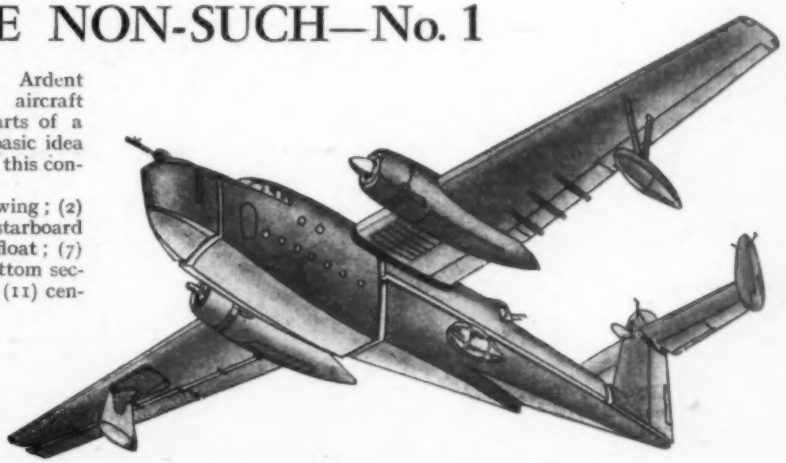
COMPOSITE NON-SUCH—No. 1

HERE is a composite flying-boat. Ardent spotters and all interested in aircraft recognition are invited to identify parts of a dozen different aircraft. While the basic idea is not new, it has been developed, and this convincing prototype is the result.

Parts to be identified are: (1) Port wing; (2) starboard wing; (3) port engine; (4) starboard engine; (5) port float; (6) starboard float; (7) nose; (8) cabin section of hull; (9) bottom section of hull; (10) top section of hull; (11) central fin and rudder; (12) outrigger tail unit.

This puzzle picture should present little difficulty to the regular reader of *Flight*, as many of the types concerned have been dealt with in our recognition series.

(*Solution appears on page* 481)



BEHIND THE LINES

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Wanted : Skill

WHILE German efforts to expand her industrial capacity continue, a shortage of skilled men can be observed. German aircraft firms engaged on expansion programmes cannot apparently fill their vacancies in the ordinary channels, and are now trying to recruit skilled personnel from other countries.

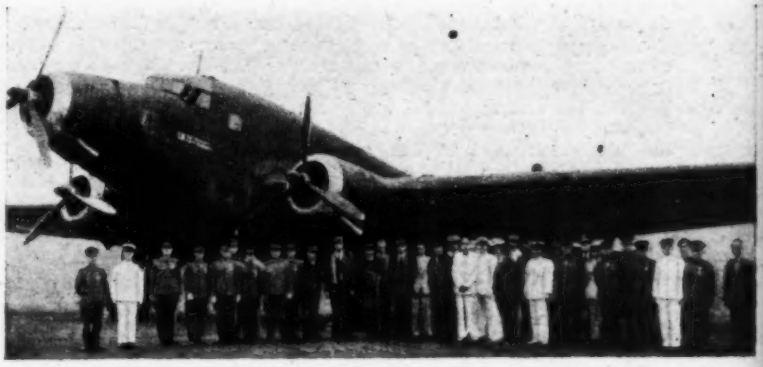
The Junkers Flugzeug u. Motorenwerke A.G., through their Dutch office in Amsterdam, Heerengracht 380, are advertising for patent experts with experience in foreign patents and knowledge of English and French. Junkers are also scouting Holland for draughtsmen, designers, designers of parts, etc.

How thorough this combing is, is demonstrated by the fact that applicants who have the technical knowledge are not necessarily required to have a command of German. Fitters and men with estimating experience are also badly required. Precision fitters and turners are wanted by the N. V. Hazemeyer's Signals and Instrument Works at Hengelo. Even for clerical staffs the Germans have to seek outside Germany. The Junkers Company, for instance, advertises in Holland for male or female shorthand typists, clerks, etc.

It would be wrong to assume that these indications of shortage of skill suggest a reduction in the production capacity of the German aircraft industry. While Russian battlefields are certainly heavily taxing German man-power resources, the search for skilled labour is also to be attributed to the endeavours of the German aircraft industry to expand and to establish new plants in "safer" areas.

Krupps

TO get as far away as possible from the reach of the R.A.F. is to-day the desire of many Germans. But while this can only remain a wish, the migration trend of the German industry continues. It is now reported from Hungarian sources that the Krupps Armament Works at Essen have established a subsidiary plant at Zagreb, Yugoslavia.



The Savoia Marchetti S.M.75 on its arrival in Tokyo. Powered with three Alfa Romeo 128 R.C.21 engines of 920/950 h.p. the S.M.75 has a disposable load of 7,700 lb., normally a service ceiling of 24,600ft. and a range of 1,860 miles. Most likely additional tanks were fitted to give extra range.

Axis Flight

A SAVOIA-MARCHETTI S.M.75, powered with three Alfa-Romeo 128 R.C.21 air-cooled radial engines of 920-950 h.p. for take-off, flew to visit the Duce's partners in Tokyo. The aircraft, captained by Lt. Col. Moscatelli, with a crew of four (all of the *Regia*), flew from Rome to Tokyo and back, a distance of 26,000 km., in four days.

The trip was made with three stops: from Rome to an advanced Italian base in the Eastern Mediterranean; from there, "across territory of the enemies of the Axis," non-stop to an air base in Asia (Indian Ocean?) occupied by the Japanese; and thence to Tokyo. To avoid the attention of the R.A.F., both the outbound and home-bound journeys were made at high altitude and without wireless communication.

An Italian report states that the meteorological and navigation difficulties involved in this flight were overcome by careful preparations and planning by the Italian Ministry. No engine or aircraft trouble was experienced.

If German reports may be considered credible, the aircraft was not a special version, but one of the types in quantity production. To what extent the hopes of the Axis will mature (that this flight marked the beginning of an air contact with the third Axis partner) remains yet to be seen.

Italian Export

TO help the *Luftwaffe* in the maintenance and repair of aircraft and engines on the Russian front, several thousands of Italian aircraft mechanics have been sent by the *Regia*.

They are reported to have been placed in several sectors well in the rear of German lines where they are to establish permanent repair workshops for damaged equipment. To ease the building problem of the new workshops it is stated that as far as possible they will be placed in unused factories.

AN AXIS EFFORT : The Macchi C. 202 single-seater fighter is powered with a Mercedes-Benz DB 601N engine of 1,150 h.p. The aircraft has a span of 34ft. 8in., length of 29ft. 6in. and its speed is about 335 m.p.h. at 22,000ft. The armament is rather light and is said to consist of two heavy calibre machine guns on the cowling.

Conflicting Appeals

THE younger generation of German women brought up in the "Hausfrau" cult, and in the belief that their only task is to contribute to the increase of future army cadres, must find the new appeals directed towards them extremely perplexing.

Since the *Luftwaffe* now urgently requires signal, telephone and teleprinter operators, an appeal is made to women between seventeen and thirty-seven to join up. Good health, a clean record and certain mental alertness are stated to be the conditions of entering, and upon completion of training the "female signal assistants" are posted in complete units, either in the Reich or in the occupied countries, or in one of the "friendly States."

As an attraction it is stated in the appeal that there will be ample opportunities to study manners and customs of other countries.

— MAURICE BROWNFOOT —

WINGS ★ FINS ★ TAIL PLANES ★ AILERONS ★ RUDDERS ★ EQUIPMENT ★ ETC.

MORRISONS

CROYDON

Twentieth of the New Recognition Series

AIRCRAFT TYPES AND H

FAIREY FULMAR

DEVELOPED from the P.4/34 prototype of 1937, the Fairey Fulmar was first announced publicly when, in September, 1940, it was mentioned in Parliament as having been in action with the Fleet Air Arm in the Mediterranean; evidently, therefore, it had by then been in production for some time.

The prototype was actually built to a specification for a dive-bomber, but although the Fulmar is substantially the same aircraft with minor—albeit externally visible—modifications, it went into service as a two-seater eight-gun fighter, having four fixed .303in. Brownings in each wing. The P.4/34 itself never went into quantity production in this country, and only two examples were ever built here, despite the fact that the design was chosen by Denmark for her Royal Naval Air Service to replace the Hawker Nimrod. They were to be made at the Royal Naval Dockyard at Copenhagen, but it is very doubtful if these plans had progressed as far as the production stage when the Germans walked into Denmark.

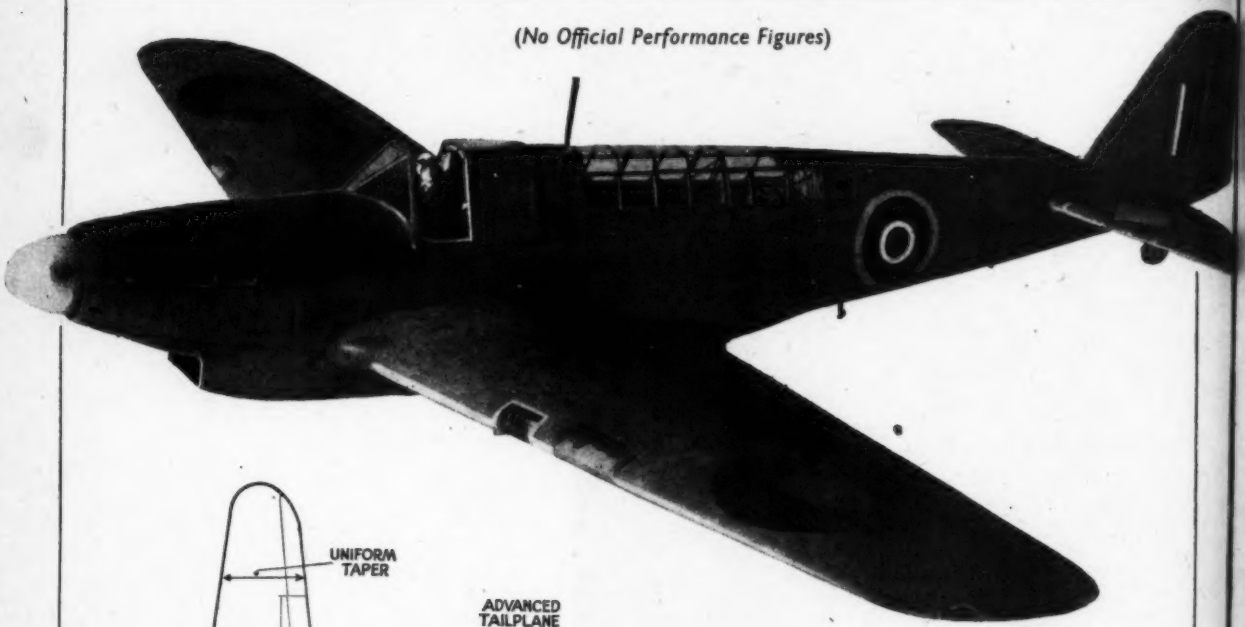
The Fulmar is an all-metal aircraft with monocoque fuselage and flush-riveted, stressed-skin covering except for its control surfaces, which are fabric covered, including the split-trailing-edge flaps. The wings fold for stowage in aircraft carriers and the undercarriage retracts inwardly, the wheels lying in recesses in the centre-section and being completely faired-in when retracted.

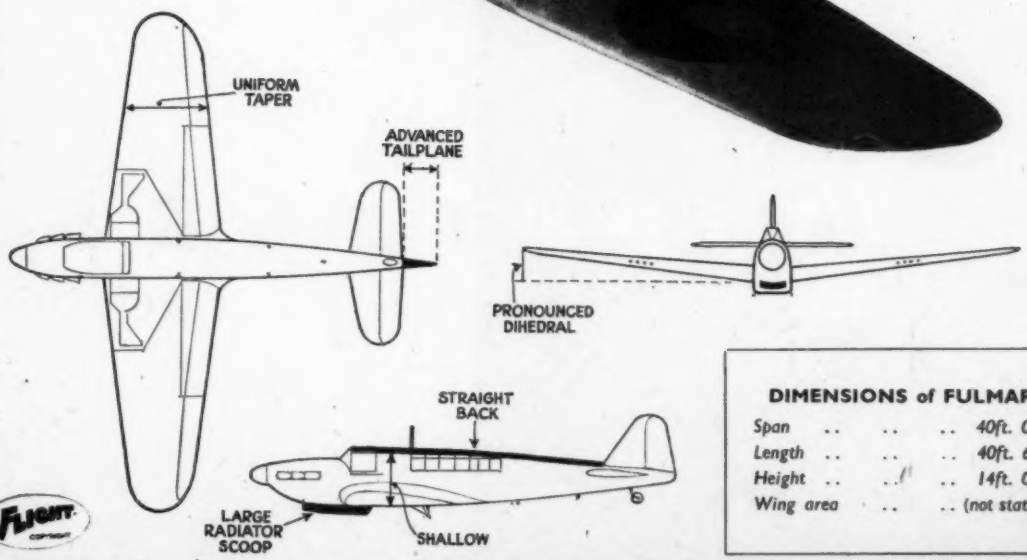
Power is supplied by a Rolls-Royce Merlin X giving 1,065 h.p. for take-off and a maximum of 1,145 h.p. at 5,250ft. The machine's top speed with service equipment has never been officially stated, but that of the prototype with the 1,030 h.p. Merlin II engine was given as 284 m.p.h. at 17,200ft., with a cruising speed of 230 m.p.h. at 15,000ft. or 245 m.p.h. at sea level. The service ceiling of the P.4/34 was 29,600ft., its range 1,000 miles, and its landing speed was as low as 55 m.p.h. for carrier operation.

The adoption of the Fulmar as a fleet fighter marked the return of a Fairey fighter to the Fleet Air Arm, the previous one having been the famous Fairey Flycatcher.

Equipment includes deck-arrester gear, catapult attachments, and stowage for an inflatable dinghy behind the rear cockpit. No rear gun is provided, the second member of the crew acting solely as a radio-operator/observer.

(No Official Performance Figures)



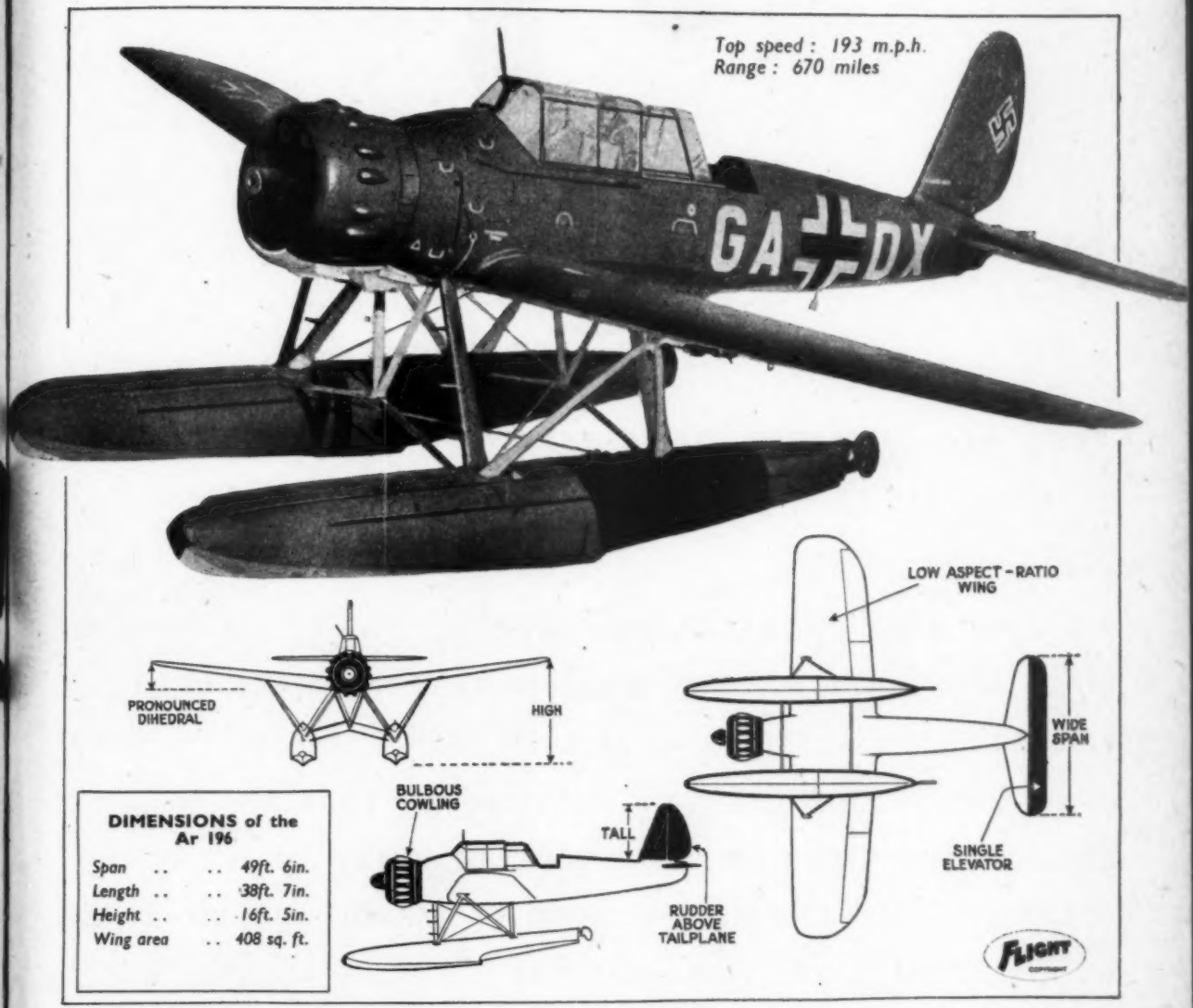


DIMENSIONS of FULMAR

Span	*40ft. 0in.*
Length	*40ft. 6in.*
Height	*14ft. 0in.*
Wing area	*(not stated)*

HEIR CHARACTERISTICS

ARADO Ar 196



DIMENSIONS of the Ar 196

Span	49ft. 6in.
Length	38ft. 7in.
Height	16ft. 5in.
Wing area ..	408 sq. ft.

ALTHOUGH primarily designed as a two-seater reconnaissance seaplane for shipboard use, the Arado Ar 196 has lately been pressed into service for intercepting bombers and flying boats at sea.

It is fairly heavily armed for a machine of its type, having two cannon in the wings, two synchronised machine guns in the top cowling firing through the airscrew disc, and one free machine gun in the aft cockpit, but recent attempts to interfere with Coastal Command aircraft have resulted in a number of Ar 196s getting themselves shot down.

One technique presumably tried without very much success was to sit quietly on the sea (weather permitting) and wait until a Sunderland or something expected to prove equally "easy" hove into view, and then to take off, climb upstairs and attack it. This, however, has all too often (for Jerry) ended by the Arado returning to the sea in a far less airworthy condition than when it left the surface, and at a considerably steeper angle.

One of the first examples of the Ar 196 to be seen was carried on the *Graf Spee*, but it was destroyed by British shells before it could be catapulted off. Several were also carried by the *Bismark* and tried, without success, to intercept the shadowing Catalina.

Powered by a Bramo-Fafnir 323 air-cooled radial engine, the Ar 196 has an almost identical fuselage to that of the Ar 95 biplane—an all-metal monocoque structure with stressed-skin covering. The wings are of all-metal construction with a mixed metal and fabric covering and have plain trailing-edge flaps. A distinctive feature of the Arado Ar 196 is its unusual design of tail unit. The rather graceful fin and rudder, with its curved trailing-edge, is perched above the wide-span tailplane, across the rear of which the elevator forms a single panel. The wings are of low aspect-ratio and taper slightly to broad, almost semi-circular tips, and are strut-braced to the twin floats. Single float versions are also in service, but appear to be less frequently encountered.

Top speed of the twin-float Ar 196 is 193 m.p.h. at 13,000ft., and cruising speed 158 m.p.h. at the same altitude. Its service ceiling is 23,000ft., and range 670 miles.

Any old thermoplastic scrap

THERMOPLASTIC SCRAP CAN BE RE-WORKED, SO SALVAGING IT IS A JOB THAT SHOULDN'T BE SHIRKED. IN POINT OF FACT, IT MATTERS QUITE A LOT WHETHER THIS SCRAP IS COLLECTED OR NOT. SCRAP ACETATE, FOR EXAMPLE, HAS A BASIS OF COTTON, AND, JUST IN CASE THE FACT'S BEEN FORGOTTEN, COTTON HAS TO COME IN SHIPS FROM ABROAD, TAKING UP CARGO ROOM WE REALLY CAN ILL AFFORD. SALVAGING SUCH SCRAP, THEREFORE, SAVES THE SHIPPING SPACE SO IMPORTANT TO THE SURVIVAL OF THIS ISLAND RACE. NOW *PLEASE* DON'T DELAY—**HAVE A THERMOPLASTICS SCRAP ROUND-UP MADE TO-DAY.** BX WILL COLLECT AND WILL SEE THAT IT'S USED TO THE BEST POSSIBLE EFFECT.

BX PLASTICS LTD., LONDON E.4 AND ELSEWHERE

LHS/BX/C161

PHOTOGRAPHY WHILE YOU BOMB

50,000,000 Candle Power Flash-light

NOT long ago, Mr. Churchill said that our bombing of Germany was now a good deal more accurate than it used to be. One reason for this is the great and recent development of night photography. Where in the past only a few photographs were taken on any raid—and they were apt to be regarded almost as curiosities—hundreds are now taken every night when Bomber Command is over Germany.

The sudden, violent glare of so many photographic flash-bombs—each of about 50,000,000 candle power—must have become familiar to the people of many German cities. They must have become as characteristic a feature of every blitz as Very lights were of trench warfare in the last war. These photographs serve two purposes. When there is an actual photograph of the target area shown, there can be no doubt that the aircraft reached its target and hit it.

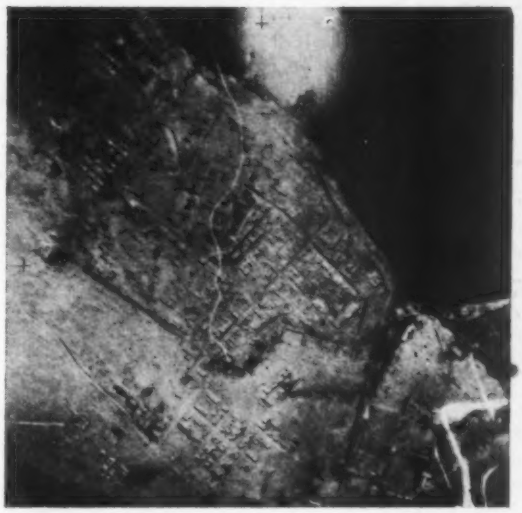
Automatic Operation

As an aircraft releases its bombs over the target a photo-flash also is automatically dropped, and this explodes with a blinding light which lasts about one-tenth of a second. As this explodes, a camera with the shutter already open takes a photograph of the area lit up by the flash. The system is much the same as grandfather used years ago when he took a photograph in the dark by taking a cap off the camera, letting off a magnesium flash, and then replacing the cap. Only now, in the place of grandfather, a system of electrical controls is used.

Formerly ten or eleven operations were necessary for a crew to take a successful photograph of the area bombed, and that in the few crucial moments over the target area. Once a wireless operator, when blamed for spoiling the photograph by dropping the flash at the wrong moment, explained that it was not his fault. Just as he was preparing to drop his flash down the flare chute some machine-gun bullets came through the fuselage and put him off. But all that is needed now is for the pilot to hold the aircraft level for a few seconds when warned by an automatic light that the flash is about to explode.

As soon as the aircraft has reached its dispersal point the camera magazines are fetched and developed in total darkness—for the films are ultra-sensitive—fixed, rinsed and dried in methylated spirits, all at high speed without wasting an unnecessary second. Then the prints are hurried to the intelligence section of the station, to group headquarters and Bomber Command.

Thus navigation is helped, and the Command is warned if Germany is trying out anything outstanding in the way of camouflage or decoys. Fires are shown in these photographs, so that the Command can judge the success of the raid, and, since the photographs are timed, of how it progressed. Only four fires are shown on an early photograph, but a few moments later these have swollen to 20, and later still the whole target is seen to be ablaze.



A flash-bomb photograph of Tobruk. The flash-bomb can be seen exploding at the top of the picture. While there can be no actual top in a vertical photograph, the picture best settles itself to the eye when the shadows fall towards the viewer.

The crews themselves take a great interest in these photographs. One of the first things crews begin to wonder about when the raid is over is what sort of photograph they have brought back with them. It is no uncommon thing for the captain of a crew to hang about intelligence after a raid is over to see if all is well with his photographs.

It might be thought that almost every aircraft would return with a satisfactory print, but there are many things that can go wrong. A pilot may have found a gap in the clouds to bomb through, but by the time the flash explodes all the camera may be recording is an artistic study of cloud formations. Or, just at the crucial moment, it may be impossible to hold the aircraft level, so that the camera will be pointing anywhere but at the area lit up.

Now throughout the Command there has been started a squadron ladder on which points are allotted for photographs which show either the target area or an area close to it. Every squadron hopes that it will be at the top of the ladder, and therefore will be the squadron which has done the best for the month throughout the whole Command. One group proudly boasted that for the month of July it held the first seven places in the squadron ladder.

Other groups then decided that this was just luck, and next month would show what they could do.

LORD TRENCHARD TALKS TO DESERT SQUADRONS

MARSHAL of the Royal Air Force, Lord Trenchard, who has been visiting desert squadrons of Allied Air Forces on forward landing grounds, dispensed with formal parades and told the men to gather round in a circle on the open desert and to smoke if they wished while he talked to them.

To Australians, Americans and South Africans he had something to say of his connections with their countries and leaders. He told R.A.F. squadrons frankly he had never thought that the spirit of the airmen of the last war could be equalled. "But," he added, "I have paid many visits to squadrons during this war in France before her fall, in England, and now out here in the Middle East, and I am convinced that you have added to the reputation of those airmen of the last war a thousandfold."

The power of the Air Force in the present war Lord Trenchard illustrated by recalling his visit to a R.A.F. station in the north of Scotland a few days before he left for the Middle East. There he met crews of three aircraft who had just made a sortie against shipping off the coast of Norway. They had sunk a ship. Now in the Middle East one of the first squadrons he visited had just been out attacking shipping in the Mediterranean. They, too, had sunk a ship.

Lord Trenchard said he had collected Goering's speeches, some 17 in all. At first they were full of "my pilots, my mechanics, my aircraft—this great weapon which I have forged which has conquered Europe and will conquer the world." But in his last speech Goering spoke for three-quarters of an hour and made not one mention of the *Luftwaffe*.

"Think that out among yourselves," said Lord Trenchard, "and decide what it means. It seems to me to suggest that Goering is no longer quite sure that his *Luftwaffe* is the best in the world."

GERMAN "OUTSIDERS"

Promising Arado Types Denied Official Acceptance

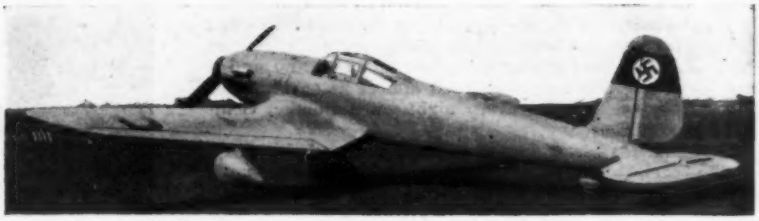
BETWEEN 1934 and 1939 the Arado Flugzeugwerke developed a number of designs which were to form the equipment of many *Luftwaffe* units. The designs were not left in the "drawing-board" stage, but were actually constructed, tested and flown. Yet, with one exception, none of them came into a wider employment with the German Air Force. In quality of design and performance these prototypes were found to be up to *Luftwaffe* specifications and, in fact, sometimes better than other types which have since become standard equipment.

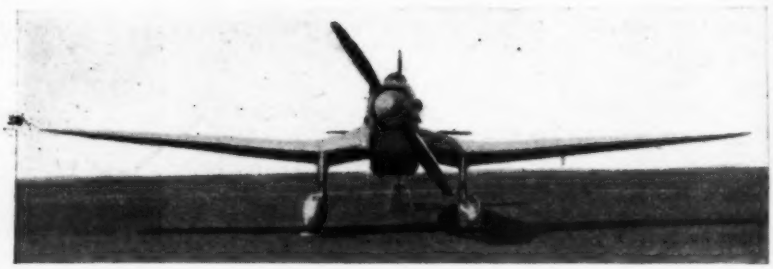
But all efforts of the Arado Company to bring their aircraft into service with the *Luftwaffe* failed, and only a few machines were made use of.

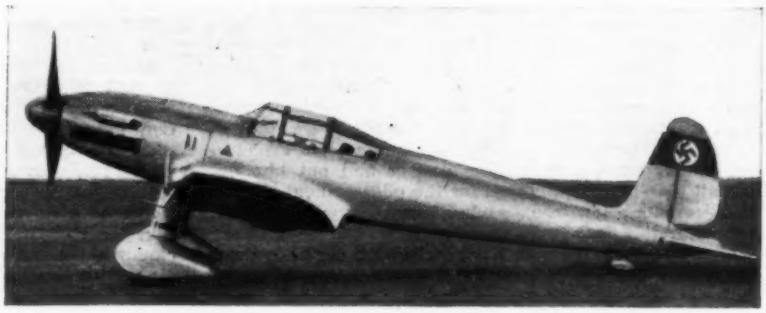
A number of reasons were responsible for this, but among them the most important was the difficulty of bringing these types into series production. Other German aircraft manufacturers were reluctant to co-operate, and refused to build the types instead of their own designs. Arguments were put forward that the mass production of the Arado types by other works would be too expensive and require different tools, etc.

Finally, a compromise appeared to have been reached; the powerful Junkers and Messerschmitt concerns and the influential Fieseler Company gained the upper hand, and a quiet distribution of "spheres of interest" was arranged.

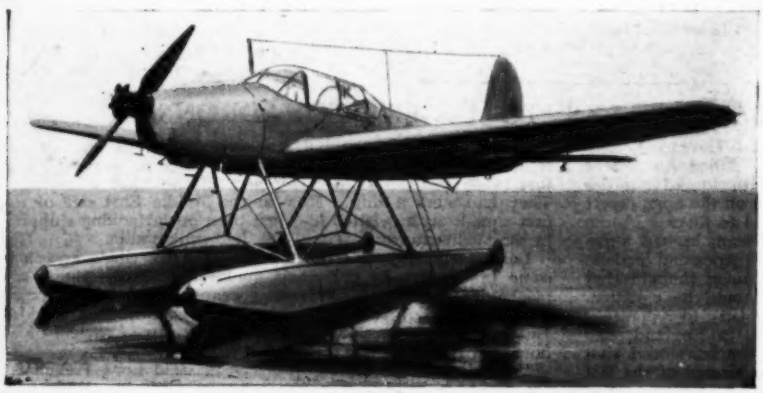
This "freezing" of designs was, in fact, mainly due to the rivalry of the leading aircraft designers. Messerschmitt, the protégé of Rudolf Hess, and a favourite of the Nazi Party which financed him between 1933 and '35, was given the construction of fighters. Heinkel, whose close contact with the High Command dated back to the last war, was to share with Junkers the orders for bombers, Henschel, the first dive-bomber, and so on. The Arado, whose "pull" was not strong enough, was left with a very limited field of activity.







The Ar 80 Arado's first all-metal construction designed in 1934 as a "pursuit" fighter. One version of the prototype was powered with a Rolls-Royce Kestrel of 575 h.p., the other with a Jumo-210-C of 610 h.p.



Arado-Ar 199, a twin float all-metal monoplane used for training purposes. It is the seaplane version of the Ar 96B land trainer.

Yet many of the ideas and features of these Arado aircraft have been made use of by the *Luftwaffe* and incorporated in other types developed since by the German aircraft industry. It is for this reason that a closer description of these types is of interest.

The Arado-Ar 80 was the first all-metal type built by this company. The original design was completed as early as 1934, and a prototype was subsequently developed, of which three versions were built. The aircraft, designed to be used as a pursuit fighter, was powered with a Rolls-Royce Kestrel engine of 575 h.p. The two other versions were equipped with a Jumo-210-C engine of 610 h.p. The Arado-Ar 80 had a span of 38ft. 7in., length 32ft. 3in., height 8ft., and climbed to 18,000ft. in 9.5 min. to 10 minutes. 30,000ft. is the ceiling of the aircraft. The calculated speed

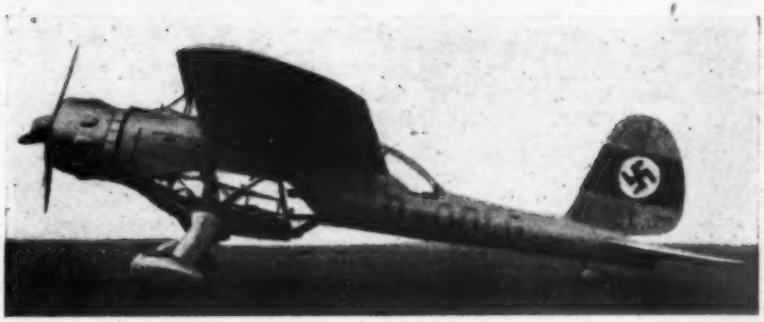
(with the Jumo-210-C engine and a v.p. airscrew) was 260 m.p.h. at 12,000ft. and 250 m.p.h. at 18,000ft. Landing speed 59 m.p.h.

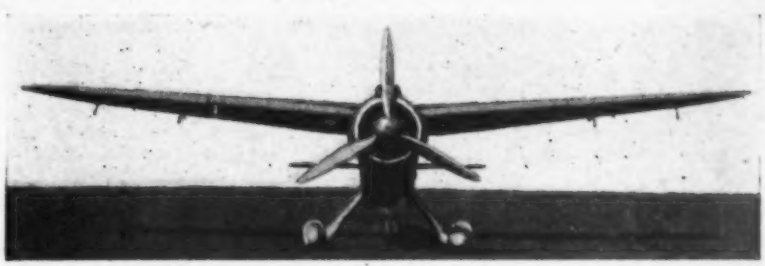
Another of this group of "outsiders" is the short-range and night reconnaissance aircraft, *Arado-Ar* 198. The front part of the fuselage is constructed in welded steel tubing, while the rear section is an all-metal monocoque structure. Particular attention was paid to give the crew a good field of vision. The Ar 198 has a span of 48ft., length of 47ft. 7in., height 14ft. 8in., and wing area of 376 sq. ft. The power plant is a Bramo 322-A 9-cylinder radial of 830 h.p.

An interesting type produced by the Arado was a two-seater all-metal biplane dive-bomber, the *Arado-Ar* 81.

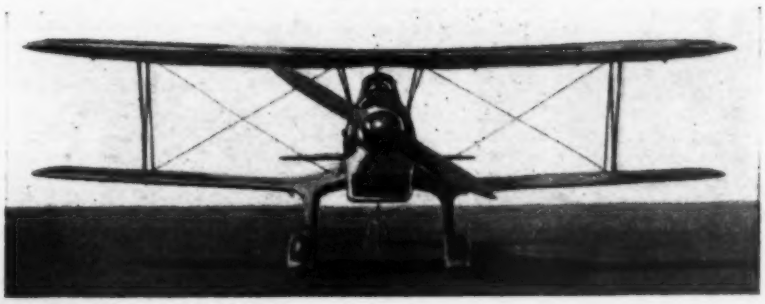
The Arado-"Stuka" has the following dimensions: Span 36ft., length 37ft., 4in., height 11ft. Weight, empty, 4,200 lb., and all-up weight (with a crew of two) 6,600 lb., power loading 11 lb./h.p., wing loading 17.6 lb./sq. ft. Equipped with a Jumo-210-C in-line engine of 610 h.p. the aircraft climbed to 12,000ft. in 11 min., and had a speed of 210 m.p.h. at 12,000ft. Terminal diving speed 370 m.p.h.; landing speed 60 m.p.h.; range 420 miles at an altitude of 12,000ft., and ceiling 25,000ft.

Apart from sub-contract work, the Arado Flugzeugwerke are now engaged in their plants at Bradenburg and Warnemünde on the production of





(Right) The Arado-Ar 198 short-range night reconnaissance aircraft shown in side, front and three-quarters view. (Below) A Stuka-Arado-Ar 81 all-metal two-seater aircraft for dive bombing, powered with a Jumo-210-C in-line engine of 610 h.p.



the following types of their own design: The *Arado-Ar* 96B, a two-seater, low-wing, cantilever monoplane. An all-metal structure with a retractable undercarriage, and powered by an Argus As-410-A twelve-cylinder inverted V-type air-cooled engine of 450 h.p. This aircraft has been adopted since 1940 as a standard advanced trainer and is now in quantity production.

The Arado-Ar 199, the only one of these types which came into wider service, is a twin-float, all-metal low-wing monoplane for training purposes. Powered with an As-410-C V-shaped in-line engine of 380 to 540 h.p., the aircraft has a climb of 9,480ft. in 11 min., a speed of 161 m.p.h. at 9,000ft., and a landing speed of 50 m.p.h.

Another type is the *Arado-Ar* 196 a twin-float, low-wing, semi-cantilever monoplane of all-metal construction, powered with a Bramo-Fafnir 323 nine-cylinder air-cooled engine of 920 h.p. This two-seater aircraft has a maximum speed of 193 m.p.h. and range of 670 miles, used for reconnaissance. It is the standard catapult seaplane of the German navy.

COLOGNE RAID V.C.

F/O L.T. Manser's "Determination and Valour" as Captain of a 50 Squadron Manchester

"HE was one of the most competent captains we have ever had in 50 Squadron. Whatever task was set him, he did it willingly and without question. All who met him became his friends and everyone in the squadron felt his loss as a personal blow."

Such was the tribute from his squadron commander, Wing Cdr. R. J. Oxley, D.S.O., D.F.C., to F/O. Leslie Thomas Manser, who was posthumously awarded the V.C. for his heroism on the Cologne raid on the night of May 30th.

"When I told the squadron," added Wing. Cdr. Oxley, "how Manser, on his last sortie on Cologne, showed his determination by attacking the target with one engine out of action, and then gave up his life to save the lives of the rest of the crew, we all felt humbled by what he had done. We realised that he had set an example for the rest of us to live up to, and that he had established a tradition for the squadron."

The official citation reads as follows:—

"F/O. Manser was captain and first pilot of a Manchester aircraft which took part in the mass raid on Cologne on the night of May 30th, 1942. As the aircraft was approaching its objective it was caught by searchlights and subjected to intense and accurate anti-aircraft fire. F/O. Manser held on his dangerous course and bombed the target successfully from a height of 7,000 ft.

"Then he set course for base. The Manchester had been damaged and was still under heavy fire. F/O. Manser took violent evasive action, turning and descending to under 1,000 ft. It was of no avail. The lights and flak followed him until the outskirts of the city were passed. The aircraft was hit repeatedly and the rear gunner was wounded. The front cabin filled with smoke; the port engine was over-heating badly.

"Pilot and crew could all have escaped safely by parachute. Nevertheless, F/O. Manser, disregarding the obvious hazards, persisted in his attempt to save aircraft and crew from falling into enemy hands. He took the aircraft up to 2,000 ft. Then the port engine burst into flames. It was ten minutes before the fire was mastered, but then the engine went out of action for good, part of one wing was burnt, and the air speed of the aircraft became dangerously low.

"Despite all the efforts of pilot and crew, the Manchester began to lose height. At this critical moment, F/O. Manser once more disdained the alternative of parachuting to safety with his crew. Instead, with grim determination, he set a new course for the nearest base, accepting for himself the prospect of almost certain death in a firm resolve to carry on to the end.

"Soon, the aircraft became extremely difficult to handle and, when a crash was inevitable, F/O. Manser ordered the crew to bale out. A sergeant handed him a parachute but he waved it away, telling the non-commissioned officer to jump at once, as he could only hold the aircraft steady for a few seconds more. While the crew were descending to safety they saw the aircraft, still carrying their gallant captain, plunge to earth and burst into flames.

"In pressing home his attack in the face of strong opposition, in striving, against heavy odds, to bring back his aircraft and crew and, finally, when in extreme peril, thinking only of the safety of his comrades, F/O. Manser displayed determination and valour of the highest order."

F/O. Manser's home was at Radlett, Herts.

Death of Gerry Sayer

WE deeply regret having to record the death of P. E. G. Sayer—known to the whole aircraft industry as "Gerry"—in a flying accident on Thursday last, October 22.

Mr. Sayer first entered the R.A.F. in 1924 and resigned his commission in 1930 to become second test pilot to P. W. S. Bulman, of the Hawker Aircraft Company. Shortly after the Hawker concern had taken over the Gloster Aircraft Company in 1934 he was appointed chief test pilot of Glosters. In recognition of his work he received the O.B.E. in this year's New Year Honours list.

The late P. E. G. Sayer.

As a test pilot his work was outstanding, and it is regretted that security reasons preclude us from giving details of what he has been doing since the outbreak of hostilities.

An Appreciation

ANYONE who knew "Gerry" Sayer loved him. It was impossible to do otherwise. His infectious smile and gentle humour were always present. I never knew him to be worried or "under the weather" however difficult or dangerous a task on which he might be employed.

While at Brooklands he frequently flew me in the old Hawker Hart G-EBMR, when I was photographing Hawkers' latest products in the hands of Flt. Lt. Bulman. They formed the perfect team, each trusting the other completely, and it was a revelation and joy to fly with such pilots.

"Gerry's" navigation was uncanny. I remember on one occasion he flew me from Hawkinge back to Brooklands when visibility was to all intents and purposes nil. It was like flying in a vertical tube with the tiniest bit of blue above and a dim view of one or two fields below. As he passed over the racing track at Brooklands, dead on our course, he turned round and smiled as if to suggest that it was all luck and skill did not enter into it. Just a typical example of his self-abnegation. He will be sorely missed. Such men of such ability and such qualities are rare.

J. Y.

Aircraft Production

THE November issue of *Aircraft Production*, now on sale, price 2s. 6d., is if anything more than usually interesting. There is an article dealing with the very important saving of power by using the aircraft engines themselves, when on test, for the generation of electricity, and examples are quoted from this country and America of successful power reclamation of this nature. The conclusion is reached that, if production is on a sufficiently large scale, power recovery is quite a practical proposition.

Production methods employed in the building of the Vickers-Supermarine Walrus amphibian are described, and there is an instructive article on the design, operation and manufacture of the Rotol electrically-operated airscrew. "Production Density," or the maximum production per square foot of factory pace, is the subject of another article, and undercarriage manufacture (that of the Short Stirling) is dealt with extensively. All the usual features will be found in the November issue, and, in addition, there are many short articles on a variety of subjects.

PLASTIC PROGRESS

Some Recent Developments : Bonding Metal to Plastics

By W. NICHOLS, A.R.Ae.S.

IT is pleasing to be able to record, when the authorities permit, items of progress made with plastics in aircraft production. Actually the plastics sections of the British aircraft industry has made great strides, and it is now probably the equal of that of any other country in the world.

One of the latest developments, of which particulars may now be divulged, is a method of bonding metal to plastics, carried out by Aero-Research, Ltd., directed by Dr. N. A. de Bruyne, M.A., Ph.D. The process, known as "Plastel," ingeniously makes use of metal stabbed all over with small burred holes. The re-entrant edges of these burred holes engage with the plastic so that the metal and plastic are firmly locked together. An illustration shows the nature of the material in the form of a hinge between two pieces of cellulose acetate made with "Plastel." Although not apparent from the photograph, the surface of the "Plastel" is actually quite smooth. It should be pointed out that "Plastel" may be used in conjunction with any other plastic (thermosetting or thermoplastic).

The objects of bonding metals to plastics fall under two main headings: (a) improvement in flexural stiffness; (b) improvement in dimensional stability. The improvements obtained are such as to offer a wide range of applications of the composite material.

Improvement in Flexural Stiffness

Under certain conditions the flexural stiffness of any plastic material can be considerably increased, without a proportionate rise in weight, by bonding a thin metal coating to the two sides of the plastic sheet. The flexural stiffness of a "sandwich" panel of cellulose acetate between thin steel covers will, if correctly proportioned, be greater than that of a sheet of duralumin of the same surface area and same weight, and is far greater than the flexural stiffness of either steel alone, or of cellulose acetate alone, of the same weight and surface area as the "sandwich."

All plastics have about the same specific gravity, and the stiffness is primarily determined by the separation between the metal covers; roughly speaking it is, therefore, only the specific gravity of the filling that is the decisive factor.

If plywood is used, a material less dense than plastics, the stiffness is much increased.

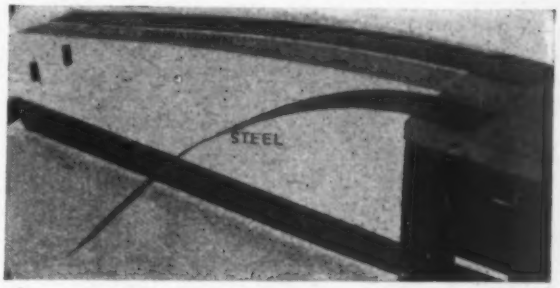
Outer Layers	Inner Layers	Maximum stiffness of Strip 1in. Wide
Steel	Formvar	$2,505 \times 10^6 \times W^3$
Steel	Cellulose acetate	$1,986 \times 10^6 \times W^3$
Steel	Laminated fabric plastic	$2,035 \times 10^6 \times W^3$
Steel	Plywood	$5,964 \times 10^6 \times W^3$
Duralumin ..	Laminated fabric plastic	$2,220 \times 10^6 \times W^3$
Duralumin ..	Plywood	$6,700 \times 10^6 \times W^3$

The above table gives values for the maximum stiffness of strips 1in. wide. They have been confirmed experimentally and should be compared with the values for the materials by themselves, given below.

Material	Maximum Stiffness of Strip 1in. Wide
Steel	$111.5 \times 10^6 \times W^3$
Duralumin	$809 \times 10^6 \times W^3$
Laminated fabric plastic	$731 \times 10^6 \times W^3$
Plywood	$5,125 \times 10^6 \times W^3$
Formvar	$381 \times 10^6 \times W^3$
Cellulose acetate	$56 \times 10^6 \times W^3$

W = weight of 1 sq. inch of "sandwich."

A steel panel has a very poor flexural stiffness compared with a duralumin panel of same weight and area. According to Dr. de Bruyne, the duralumin panel is seven times as stiff as the steel, but a sandwich of steel with a plastic filling will be two and a half times as stiff as a duralumin panel.



A simple demonstration of flexural stiffness. The steel, duralumin and "Plastel" strips are all of the same weight and area.

Plywood, a very stiff material by itself, gives 10 per cent. increase in stiffness when used as the inner layer in a correctly proportioned sandwich with duralumin outer layers.

Dr. de Bruyne points out, however, that the above analysis assumes that the bonding between the layers of the "sandwich" are complete or continuous. With his "Plastel" process the bonding is not continuous, and experiment shows that the values for maximum stiffness are only half the values given above. Thus a "Plastel" sandwich of steel on plastic has a stiffness of about 1,000 $\times 10^6 \times W^3$. This stiffness is, however, greater than that of steel alone or of any plastic (except Gordon Aerolite) alone, and "Plastel" has a stiffness somewhat greater than duralumin alone.

The accompanying photograph, supplied by Dr. de Bruyne, clearly demonstrates these facts. All the strips shown in the photograph are of the same length, same width, and all equally loaded.

The steel strip is deflected most. Because of its high density it has to be very thin in comparison with the other materials to be of the same weight. Since flexural stiffness is proportional to the *cube* of the thickness, the steel strip deflects the most because its high Young's Modulus is nullified by the small depth of the beam. The "Plastel" strip is of stainless steel with a plastic middle layer made of paper—reinforced phenol-formaldehyde. It can be regarded as a steel strip expanded to a reasonable thickness by the use of a lightweight filling.

This gain in stiffness without increase in weight is of importance in the use of plastics for instrument panels and where large flat surfaces occur. The gain in resistance to abrasion and heat is also an important factor.

Dimensional Stability

Another purpose in bonding metal to plastics is to obtain dimensional stability despite changes of humidity and temperature. Practically all plastics (the chief exception being polystryene) change their dimensions considerably with changes in moisture content. These changes are extremely marked in cellulose acetate, and they are quite significant in Bakelite materials. The graph given herewith shows swelling and shrinkage curves in fabric-reinforced laminated Bakelite sheet in comparison with the behaviour of the same sheet covered with stainless steel by the "Plastel"

PLASTIC PROGRESS

process. The two strips were originally of the same length (123 mm.) and were immersed simultaneously in water. After 60 hours' immersion the "Plastel" appeared to have reached equilibrium while the plain specimen was still swelling. Both specimens were removed after 70 hours and allowed to dry at room temperature. At 125 hours they were immersed in water again, and at 165 hours they were removed from the water. From the photograph the contrast in the behaviour of the two specimens is striking.

"Plastel" Under Test

The behaviour of cellulose-acetate sheet under conditions of high temperature and humidity has given rise to many troubles with aircraft in tropical countries. Immersed in hot water it first swells due to water absorption and then shrinks due to loss of plasticiser and becomes brittle. As a result, windscreens and fairings have been found at times to crack round the bolt holes where they are secured.

Dry-heat tests were carried out on strips of acetate 10in. by 1in., subjected to a temperature of 60 deg. C. for three weeks. Three plain and three "Plastel" specimens were tested, using black (pigmented) acetate sheet; also three plain and three "Plastel" specimens using transparent acetate sheet. The average results obtained by Dr. de Bruyne are shown below:—

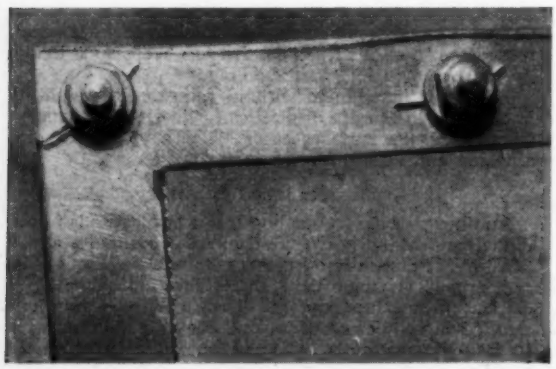
	Transparent Acetate		Black Acetate	
	Plain	Plastel	Plain	Plastel
Per cent. decrease				
Length ..	1.97	.095	1.89	.084
Width	1.12	.049	1.53	.039

It will be seen that the shrinkage was much reduced. The plain uncovered specimens were badly warped but the "Plastel" specimens were still flat, though they appear to have decreased in thickness to the same extent as the plain specimen.

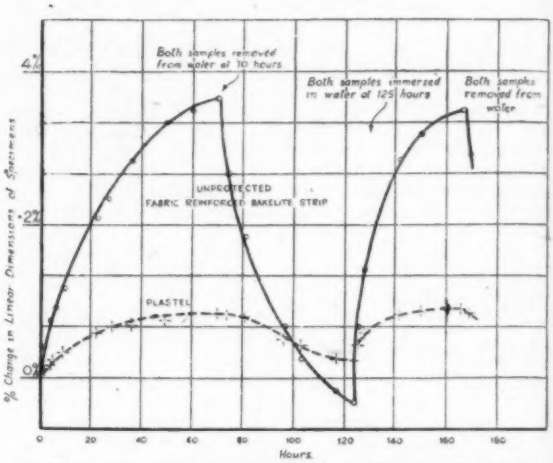
The photograph shows the comparative appearance of two specimens after the test.

In order to test the effect of "Plastel" under conditions approximating to those of practice a panel test was carried out in which a plain transparent acetate sheet was bolted to one side of a rigid steel frame while a similar sheet, but with a "Plastel" edge binding 1in. in width, was bolted to the other side. This test simulated the conditions of an aircraft cockpit hood, or landing light panel in the leading edge of a wing, in which the transparent sheet is attached to a rigid structure.

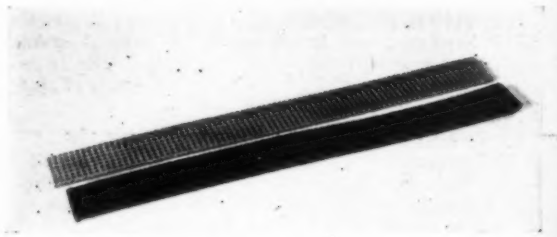
The whole assembly was then subjected to a temperature of 60 deg. C. at a relative humidity of about 100 per cent.



Corner of acetate sheet on conclusion of test. Note cracks at bolt holes.


Both samples removed from water at 70 hours
Both samples immersed in water at 125 hours
Both samples removed from water
UNPROTECTED FABRIC REINFORCED BAKELITE STRIP
PLASTEL
% Change in Linear Dimensions of Specimens
Hours.

Swelling and shrinkage of fabric-reinforced Bakelite and "Plastel"-covered material.

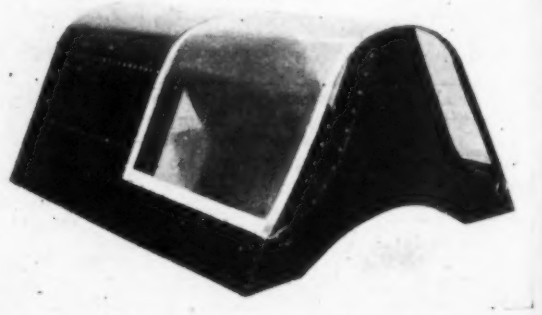


"Plastel" and control specimen of plain black acetate after three weeks at 60 deg. C.

for three weeks. The photographs give an idea of the difference in appearance before dismantling the assembly.

As an example of the practical use of "Plastel" a photograph of the rear half of a transport cockpit cover is shown herewith and gives a very good impression of the neat and clean design made possible with this material. The absence of rivets and bolts, and the ease of removal, are interesting features of this cover. "Plastel" may also be used with Perspex to great advantage and is approved for use in British aircraft. It is fully covered by patents in this country and abroad.

Very large mouldings are now made by stretching thermo-plastic resins over simple wooden frames. By



"Plastel" applied to the rear half of a transparent cockpit cover. Note absence of rivets or bolts, and the ease of removal.

PLASTIC PROGRESS

means of "Plastel" these can be stiffened where necessary, particularly around the edges. In a general way it brings steel back into competition with light alloys for this and many other purposes, and if stainless steel is used, the material has the added attraction of non-corrodibility.

A New Adhesive

Another product of Aero Research, Ltd., which has actually been in use for over two years but only recently released from the secret list, is an adhesive by the trade name "Ardux."

From the description given by Dr. de Bruyne, "Ardux" is an adhesive capable of joining phenol-formaldehyde or urea formaldehyde mouldings or laminated sheet with such efficiency that the shear strength of the joint usually exceeds that of the parent material. The following extract from a report issued by the Royal Aircraft Establishment is striking evidence of the strength of "Ardux" joints: "We have now tested these joints and enclose a table giving the failing loads. The tests were made with the standard glued-joint grips.

"As in every case the fractured area showed shearing of the parent material rather than the joint failure, the adhesion was efficient, and joints may be regarded as of satisfactory strength.

Group	Failing Load lb.	Mean apparent Shear Stress at Failure in lb./sq. in.
Group 1: ⅛in. thick laminated impregnated paper material	913	913
Group 2: 1/10th in. thick paper reinforced synthetic resin sheet.	500 550 560 412	1,000 1,100 1,120 824

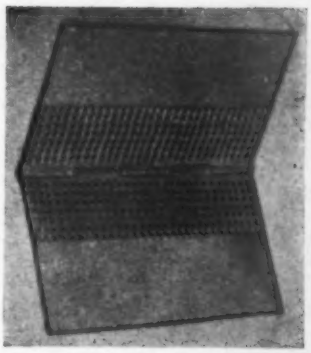
"In group 1 failure occurred largely by the shearing of the synthetic resin material, only small areas of glue failure being visible. In group 2 failure occurred entirely by shearing of the plastic material, no glue failure could be seen."

"Ardux" is a suspension of powder in a reactive resin and is unique in its speed of setting and its reliability, this combination giving results hitherto unattainable with existing synthetic resin cements for Bakelite materials.

"Ardux" is applied to the surfaces to be joined, which are then left for a few minutes to become tacky (a gentle warming will hasten this process) and finally clamped together with an ordinary G clamp. The joint must then be heated to not less than 140 deg. C. (284 deg. F.). At 155 deg. C. "Ardux 1" will set in six minutes. "Ardux 2" is not quite so fast in setting. Roughening of the surfaces is not necessary since "Ardux" does not depend upon mechanical keying for its adhesion and is equally efficient applied to highly polished surfaces. Where flat sheets are to be joined the heat can be conveniently applied by clamping the joint to a steam-heated hot-plate.

"Ardux 1" should be used for well-fitting joints and "Ardux 2" for metal inserts and where gap joints have to be made.

"Ardux" has no specific adhesion for metals, but it can be used with great success to secure metal inserts into mouldings and laminated sheets if the root end of the metal insert is knurled. The necessary hole may be drilled, or it can be made in the moulding operation. It should be of such a diameter that the metal insert is a good push fit. Simple knurling is sufficient, the grooves or threads being not more than 1/64in. deep, otherwise the adhesive will not expand sufficiently to fill them. "Ardux" is applied to the hole and the metal insert pushed in; heat can then be applied. This is most conveniently done by bringing the protruding end of the metal insert into contact with a heated block. An electrically heated soldering iron is convenient for small jobs, but where large numbers of inserts have to be fixed it is worth while making a jig for the purpose. "Ardux" is officially approved as an adhesive for synthetic resin materials for aircraft uses.



Hinge between two pieces of cellulose acetate, made with "Plastel." The metal is stabbed all over with small burred holes, thus locking it to the plastic.

In my previous article "Plastics and Aircraft" (*Flight*, September 14th and 24th and October 1st), it was suggested that means should be provided to dispense with metal fittings which still appear necessary where main structural joints are required, and that this could be overcome to some extent by providing plastic inserts cemented to the wood structure to obtain the required strength in bearing.

It is interesting to record, therefore, that the De Havilland Aircraft Company have for some time now been using a fabric-reinforced plastic material cemented to wooden members of aircraft to give additional local strength. The bearing strength is some four to five times greater than that of hardwood, and the material is not susceptible to warping or shrinking; furthermore, it has no grain to encourage splitting. Inserts of this material cemented to wood on each side have been used for tailplane spar roots and other joints to increase bearing strength around bolt holes. In thinner form it can be used for floor coverings in cockpits, and in this case has the advantage of being impervious to the action of oil or petrol.

The Society of British Aircraft Constructors are very much alive to the value of plastics in aircraft construction, and every effort is being made to provide the manufacturers and their designers with the latest data available from the plastics industry. For example, The British Plastics Federation records a request from the S.B.A.C. for the preparation of schedules of properties for various plastics and resins for the benefit of aircraft manufacturers. The Federations Plastic Materials Section has appointed sub-committees to collate the required data.

NON-FERROUS METAL URGENTLY NEEDED

THOUSANDS of slow-going hazardous sea miles lie between vital natural sources of metal supply and the hands that must fashion this metal into munitions.

Copper, lead, tin, zinc—mined in Africa, North and South America and Australia—are urgently wanted in pure form for work; and as urgently required because they provide between them in alloyed form brass, bronze and anti-friction bearing metal.

Two miles of copper wire are needed for a bomber, as well as brass for instruments, aluminium for fuselage and fittings, and anti-friction metal for engine bearings. The production of guns, tanks, shells, bullets and numerous other forms of equipment for the Fighting Forces all demand thousands of tons of non-ferrous metals.

To speed up the supply of non-ferrous metals and to save as much shipping as possible, the Ministry of Supply has issued an urgent appeal for all unwanted copper, zinc, lead, pewter, white metal, brass, bronze and scrap aluminium.

Firms connected with the aeronautical industry are asked to search out all useless non-ferrous metal they may hold and send it either to the nearest local depot or to a scrap metal merchant.

ENGINEER OFFICER'S

Photographs of Some of the Ma

Working Day of an Enginee

One Who Must Be Mentor

Designer, Expert or Navvy in Tu

IN previous wars anything, with the exception of guns, which had to "work" was promptly handed over to the Royal Engineers to play with, and the fighting man occupied himself with polishing his bayonet. Even the Royal Air Force itself started life in February, 1911, as the Air Battalion of the Royal Engineers. To-day the story is very different. Even the infantry is mechanised and carries a large proportion of automatic weapons.

For sheer complexity of weapons the Royal Air Force is away ahead of either of its senior services. The firing of an aircraft cannon or the dropping of a bomb is but the ultimate stage of a process made possible by the employment of many ancillary services. The work of these services falls naturally into three groups —instal'lation, maintenance and repair. Installation, generally speaking, is done before the aircraft or equipment is taken on charge by the unit, but maintenance and repair is looked after by the station personnel under the watchful eye of an engineer officer.

It is the engineer officer who decides whether a repair can be tackled at the station or whether it must be sent away to a repair depot. It is he who must be on the scene to decide what is wrong

With his electrical officer he discusses the day's report, which shows how many aircraft are serviceable and how many need adjustment or repairs.

Arrival by bicycle at Station Headquarters to start the day's business. Note the three-speed gear to make things easy for the legs.

(Left) Assess the interi damage ca by flak to wing.

(Below) Engines are all ove hauled at certain hourages running.

On the airfield he supervises the digging-out of a bogged Stirling. When fully loaded the Short Stirling carries a load of 15 tons on each wheel and bogging occurs if it runs off the runway or perimeter track on to soft earth.

(Above salvage wreckag most ca through nothings wasted, repairabl

(Right) pairs wh ng or handle a ernal done u Here th Officer is ntending work on of a Sh The gun had to be removed the nece to b

DAY

ctivities Which Go to Make Up the
fficer at a Bomber Station:
echanic,

(Left) Watching a girl of the W.A.A.F. cleaning and testing sparking plugs. The plugs are put under compression and tested for firing.

(Above) Even the parachute room comes under the Engineer Officer. 'Chutes must all be unpacked, hung for a while in a specified temperature and then repacked.

with a refractory engine or why an undercarriage leg is not functioning quite as it should do. No detail is too small for his purview. Even plug-cleaning must be supervised, parachute-packing checked, and salvage dumps searched for material or parts in usable condition.

All this takes place on stations where the officers' mess may be three miles from the farthest dispersal point; where the perimeter track is over two miles round. Does this busy man have a car at his beck and call? No. He goes by bicycle!

(Below right) Watching work in progress on an electrically-operated Rotol airscrew belonging to a Bristol Hercules.

(Above) At the salvage dump all wreckage must be most carefully gone through to see that nothing serviceable is wasted, and nothing repairable is scrapped

(Right) Aircraft repairs which are too big or complex to handle at the dispersal points are done under cover. Here the Engineer Officer is seen superintending major work on the tail end of a Short Stirling The gun turret has had to be completely removed to enable the necessary work to be done.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

CONTROL OF THE RUDDER

Rotatable Stick Has its Dangers

I SHOULD like to pour a little cold water on the idea of a rotatable stick instead of a rudder bar, advocated by previous correspondents. It would be dangerous, especially in heavier types of plane. Imagine approaching to land, your right hand on the throttles and your left hand on the stick. If you want to turn to the right, you push with your left hand, and down goes your nose. Or, if you want to pull up your nose, you pull with your left hand and forthwith skid away to the left.

In normal cruising the idea might work out all right, but for taking off and landing it would be unnecessarily perilous. And, anyway, to do away with the rudder bar would surely be a waste of a good pair of feet?

GEORGE EADES, Fl./Lt.

SPERRY-DIRECTED

Gap Difference in Falling Bombs

IN the picture on page 382 of *Flight* dated October 8th, showing bombs leaving a Fortress, the caption writer attributes the uneven gaps between the stick of bombs to slight inaccuracies in the electric release.

Is it not a fact that on the Fortress the bombs are not carried side by side or one behind the other as in British practice, but one above the other, horizontally, but in vertical rows, so that the highest bombs are some feet above the lowest? Presumably all the bombs in one row must be released in turn from the bottom, but the release could alternate with bombs in other rows. The biggest difference in gap would be the release of a bomb from the top of one row following the release of the bottom bomb in another row.

Without knowing the sequence of release, it is surely impossible to say from the picture whether the timing of the electrical distributor gear is accurate or not. A. P. GLENNY.

THE TORPEDO BOMBER

In Defence of the Swordfish

I SHOULD like to point out a wrong impression which is given in your description of the Grumman Avenger which appears in this week's *Flight*.

It is true that this aircraft carries a 21in. torpedo—and this fact has been given a considerable amount of publicity—but the American torpedo, like so many of their aircraft, is a much "tubbier" affair than the British, and actually carries an explosive charge no greater than that of our 18in. "kipper," which has, after all, a certain number of successes to its credit.

The subject of torpedo bombers is certainly a vexed one, but it is perhaps not generally realised that a high maximum speed is not always an advantage—particularly when night attacks are visualised. The low speed at which a torpedo must be dropped means that, in a fast aircraft, it is very near the stall when in dropping position; this, in turn, means that it has to fly very close—often suicidally close—to its target after the torpedo has been dropped.

The much-maligned Swordfish, so often described as obsolete, and which carries a load almost twice that of a Hudson or Blenheim, is so manœuvrable at low speeds that it is probably in less danger from the target-ship's guns than its newer brothers, the Beauforts and others. It is also controversial whether it is easier to evade fighters by having a top speed of 270 m.p.h. (a wide turning circle) or the faculty of doing tight turns with 60 knots on the clock.

For night or low visibility attacks certainly, where great manœuvrability at the last moment is more important than speed in reaching and returning from the target, I'd rather have a Swordfish. In daytime there's no future in the job anyway. "STRINGBAG."

Designers' Nightmare

I READ with interest the letter from Mr. R. Hudson on the torpedo bomber (*Flight*, October 15th) and some may think his specification over-optimistic.

I, on the other hand, do not think that your correspondent has gone far enough. I would cut out the wings altogether. With infinitely high wing-loading the speed should be in the neighbourhood of 700 knots. My specification would carry at least six of the new 42in. torpedoes and an ingenious system of slots and flaps would give it a landing speed of less than 45 knots.

Rocket propulsion would do away with such trivialities as airscrews, engines, petrol and oil. I would put the rudder where the engine normally is, and this could be used as an elevator.

I am at present working on a scheme to eliminate the pilot. If anything turns up, I will let you know.

J. R. GODLEY.

Possibilities in the Beaufighter

MR. R. HUDSON'S suggested specification for a torpedo-bomber, which appeared in *Flight* of October 15th, is interesting but rather optimistic when one examines it in detail.

In the first instance the H.P. required for the aircraft is exceptionally high, and would almost certainly be impossible to achieve if the all-up weight were to be kept in the region of 20,000lb.

This one point thus affects the other requirements, which do not themselves offer any insurmountable difficulty.

A boosted-up version of the Beaufighter would probably come as close to the specification as any specially designed aircraft. AERO.

Defensive Armament Essential

I WOULD like to make the following comments on the article by Mr. R. Hudson, on "The Torpedo Bomber," published in the Correspondence page of the October 15th issue of your journal.

Mr. Hudson thinks one of the chief characteristics should be that the aircraft should have no defensive armament. How are the crew of the aircraft to defend themselves if attacked by enemy aircraft? If they were attacked before they reached their objective they would never succeed in reaching it without exceptional speed and manœuvrability; and even then I doubt if they would succeed.

He also suggests that arrowplanes be used, with the elevators functioning as ailerons. That, in my opinion, is absolutely impracticable owing to the fact that an aircraft often has to use the elevators at the same time as the ailerons—in a climbing turn, for instance, it has to use ailerons, elevators and rudder. If the elevators were incorporated with the ailerons, the pilot could not use them as ailerons and elevators at the same time.

J. W. WOODD.

SEVERSKY SPEAKS OUT

We Britons Are Too Modest

AS a regular reader of *Flight* I came across Mr. John Hewes' letter on Seversky's article in *Flight* of October 15th. I agree entirely with the first part of his letter. American aircraft have been boosted up too much in this country. No doubt, because of the wish to promote closer friendship between our two countries. This, however, does seem to put things in the wrong perspective.

It also appears to attempt to advertise the fact that we are supposed to be getting a great many aircraft from the United States. According to an American Senator, writing in the publication *Readers Digest*, this is not so. Further proof is in Mr. Oliver Lyttelton's recent speech. Figures given are not impressive.

However, it is not my intention to run down our Allies, but to put forward my own opinion on the subjects in Mr. Hewes' letter. He states that he is pleased by the references in newspapers that the Huns have some very good machines, and we British have not the monopoly where technical quality is concerned. That may be, but the great trouble in this country is self-depreciation.

I have been disgusted at times, when, in the little spare time I have, I visit a cinema, to see the lack of enthusiasm shown for our achievements. I have seen audiences go wild over pictures of Russians bringing down German aircraft, and refusing even to clap at our lads going through day after day of anxiety and fighting, menaced by aircraft, by submarine, and by surface raider, to bring munitions to these same Russians.

Many of those people would agree that the Focke-Wulfe Fw 190 was the fastest fighter in the world, and that the Junkers Ju 86P1 flies so high it cannot be caught, *and* that when the war is won, we (the British) will have had very little to do with winning it.

Does Mr. Hewes' idea that the present newspapers' opinions are a contrast to 1939 and '40 mean that they, or he, think we are not doing as much as we did in these years?

Does he think that we have not kept pace with technical development?

Does he believe that the Fw 190, for instance, is really the fastest fighter in the world?

I am not without a little experience myself and I should have thought the Republic P-47 Thunderbolt, or the Hawker Tornado or Typhoon, were more in line for that title.

Finally, I disagree entirely that it is a good thing to imagine your enemies' equipment superior to your own, under the excuse that it promotes greater efforts to improve. It is decidedly bad for civilian morale, and creates an inferiority complex, and until some German aircraft have proved themselves better than our own (which they have yet to do), I will still prefer to believe in the words of one of our Statesmen, "We build the best bombers and the fiercest and fastest fighters."

G. S. HENDERSON.

PERSISTENCE OF ERROR

A Minor Historical Point

MR. GRIFFITH BREWER'S letter under the above heading in *Flight* of September 3rd, is well named, in that it gives rise to an error. Even though the mistake is of a minor character, the interests of historical accuracy engenders a desire to amplify the remarks concerning Col. Ogilvie's escape. Mr. Griffith Brewer avers that the disaster occurred on the initial flight of the aircraft, whereas it had, in fact, made a number of flights during the preceding weeks.

The airplane in question was the first of the H.P. V.1500 series, powered by two pairs of Rolls-Royce engines arranged in tandem on either side. The first flights were made with one Capt. Busby as first pilot, with Hathaway and the writer aiding and abetting.

Busby was an R.F.C. pilot back from France, and Hathaway had been an instructor with the G.W. Beatty School of Flying before that unconventional establishment had ceased to function. After a number of comparatively successful trials early in 1918 (on one of which the late and indefatigible Sir Sefton Brancker accompanied us) the airplane was grounded for a couple of weeks, when a number of minor alterations were carried out. During that period, the newly formed R.A.F. decreed that I should transfer my activities to another field, and it is only because of such action that I was not present on the occasion of the fateful trip.

From the foregoing remarks it will readily be appreciated that the crash from which Col. Ogilvie escaped as the sole survivor was far from being the initial flight. In fact, it is a somewhat disturbing thought to recall that we took off from Cricklewood airdrome (now a housing estate) with full load during the course of one of the earlier trials! F. A. KAPPY.

TEST PILOTS

Most Would Sooner Work in Uniform

I AM extremely interested in the current articles and letters on that subject which rarely receives such publicity; I refer to test pilots and their status.

As one of the lesser fry (I have only been testing for a matter of fifteen years or so) I do feel that the S.B.A.C. and G.A.P.A.N. should do something about it. I feel that a scheme for better grading of test pilots is required, but by whom and on what qualifications I would not care to say. After twenty-six years' flying, and only one serious accident, I still feel that luck goes a long way in preserving reputations—not in making them.

Your more recent correspondent, Flt. Lt., R.A.F.O. (October 15th issue), is rather scathing in his general remarks about test pilots evading military service, but on the other hand they are test pilots even though it is on their chief that the prototype work mostly falls.

There is a sort of grading even now, and always has been. The so-called "production test pilots" (whom I do not despise) have great difficulty in getting clearance for different types, both by the Air Ministry Department concerned and by the insurance company covering them, and cover for the prototypes is not given in any light-hearted manner.

Another view of their status is their own, and I am certain most of us would sooner do our work in uniform while the war lasts than walk about and be treated as a civilian fighting to keep on the right side of the N.S.O.

Why should test pilots who are R.A.F.O. not be entitled to wear uniform, even if not "On the Strength"? I guarantee a much better service from them, even though Mr. So-and-So always flies in a bowler, trilby, or other similar headgear. Collecting crews may then pay a little attention to their advice.

I depreciate the introduction of £ s. d. The good test pilot will get what he wants, somewhere or other, and good test pilots don't ask for anything astral if their insurance risks are well covered—they fly because they love their job.

By all means let us have a meeting of all concerned and see what arises out of it. S. A. H.

FAULTY FILMS

Hollywood Excels Itself

IT seems little short of criminal that these film producers should be allowed to give away to the enemy what must be the very latest ideas on camouflage and security.

For example, I saw a film the other day which culminated in an attack by a squadron of bombers on a pack (clutch, swarm, school or gaggle?) of German submarines which were operating, it appeared, within range of the American coast. By an astute bit of timing the U-boats surfaced in perfect echelon, at the precise moment when the bombers came diving out of cloud cover at the end of their flight from a U.S. airfield —the said flight, presumably, having been made at a speed somewhat in excess of that of sound.

Now it was surely bad enough to let the enemy know that the Allies have bombers capable of traversing umpteen miles of ocean in a few seconds, but the really criminal part was the disclosure that our command of camouflage has now reached such a pitch of perfection that when a squadron of B-26 Martin Marauders takes off for such an "op" it can arrive over its target looking exactly like a squadron of Wellingtons!

Worse still, this film even betrayed the fact that the metamorphosis is not accomplished in one jump, but that the machines pass through intermediate stages during which they look like at least two other types of aircraft.

Cannot something be done to prevent out military secrets being given away in this shameful manner?

The film was called "Dangerously they live." I'll say they do! ALARMED.

GYROSCOPIC CONTROL

Credit Where it is Due

IN a letter in your issue of October 1st, Mr. A. J. Payne refers to Mr. Holman's letter on automatic pilots. Mr. Holman is not able to see this letter at the moment, but I would like to answer it for him.

All Mr. Holman was anxious to do was to claim credit where credit is due. A public statement has been made by a learned judge and published in the technical Press to the effect that Meredith and Cooke's device made crossing the Atlantic by air a routine matter instead of an adventure. In point of fact, however, *all* the routine crossings of the Atlantic by air—of the Northern Atlantic certainly—prior to the war was done by aircraft fitted with Sperry automatic pilots, and probably 90 per cent. of the crossings to-day are also done by aircraft so fitted.

As for history, as Mr. Holman said in his letter, the Sperry automatic pilot was fitted and flown successfully at a public exhibition in 1914—eleven years before Mr. Payne's date of the successful flight with the Meredith and Cooke automatic pilot.

It was not Mr. Holman's object to decry in any way the Meredith and Cooke control, which is known to have many advantages of its own. There can obviously be more than one successful design.

My company, however, takes justifiable pride in the Sperry automatic pilot's long history of successful commercial and military flying, and in particular of its use in the first aircraft to make routine crossings of the Atlantic.

(For Sperry Gyroscope Co., Ltd.)
J. S. POLE,
Assistant Manager, Aeronautical Department.

Key to Composite Non-such No. 1 on page 469

(1) Port wing, *Halifax;* (2) starboard wing, *Ju 52/3M;* (3) port engine, *B26 (Marauder);* (4) starboard engine, *Boston III;* (5) port float, *Lerwick;* (6) starboard float, *Dornier Do 26;* (7) nose, *Walrus;* (8) cabin section of hull, *Sunderland;* (9) bottom section of hull, *Catalina;* (10) top section of hull, *Hampden;* (11) central fin and rudder, *Whirlwind;* (12) outrigger tail unit, *Manchester.*

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements

Fleet Air Arm Ranks

(*From the London Gazette, October* 16, 1942)

TELEGRAPHIST Air Gunners are to be eligible for advancement to Warrant rank and above.

The titles of Pilots, Observers and Telegraphists in Warrant rank or above will be :—

	Warrant Title	Commissioned Title	Lieutenant Title
PILOT	Warrant Air Officer (P)	Commissioned Air Officer (P)	Lieutenant (A)
OBSERVER ...	Warrant Air Officer (O)	Commissioned Air Officer (O)	Lieutenant (A)
TELEGRAPHIST AIR GUNNER	Warrant Air Officer (AG)	Commissioned Air Officer (AG)	Lieutenant (A)

The conditions of service of Telegraphist Air Gunners will be the same as that of Observers.

Promotions

The London Gazette, October 9th, 1942.

GENERAL DUTIES BRANCH.

Air Vice-Marshal D. G. DONALD, C.B., D.F.C., A.F.C., to be Act. Air Marshal, October 12th, 1942.

Air Comdre. W. F. DICKSON, C.B., D.S.O., O.B.E., A.F.C., to be Act. Air Vice-Marshal, June 26th, 1942.

Awards

THE KING has been graciously pleased to approve the following award, in recognition of distinguished services rendered in connection with the war :—

O.B.E. (MIL.).

Act. Sqn. Ldr. R. C. WILKINSON, D.F.M. and Bar.

For high fighting. Air crew personnel for high altitude aircraft undergo special training in decompression chambers to accustom them to working in substratospheric conditions. Both bombers and fighters for operation at 40,000ft. and over will require pressure cabins.

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy :—

DISTINGUISHED FLYING CROSS.

Sqn. Ldr. K. L. B. HODSON, R.C.A.F., No. 401 (R.C.A.F.) Sqn.—This officer has participated in a large number of sorties. He is a skilful pilot, whose personal example has inspired the squadron he commands. Much of the success it has achieved can be attributed to Sqn. Ldr. Hodson's excellent leadership.

Sqn. Ldr. J. H. WEDGWOOD, R.A.F.O., No. 92 Sqn.—In August, 1942, whilst patrolling the battle area, this officer led his squadron brilliantly in an attack against a superior number of enemy fighters. Despite the odds, Sqn. Ldr. Wedgwood so disposed his squadron that, during the combat, at least four enemy aircraft were destroyed and several more were damaged. Throughout, this officer who, in the fighting, shot down a Me. 109F, displayed great tactical ability. He has destroyed at least six and damaged many more hostile aircraft.

F/O. J. G. BENSON, R.A.F.V.R., No. 141 Sqn.

P/O. L. BRANDON, R.A.F.V.R., No. 141 Sqn.

F/O. Benson and P/O. Brandon have flown together in night operations as pilot and observer respectively. One night in February, 1942, they destroyed a Do. 217.

F/O. K. R. GRANT, R.A.F.V.R., No. 39 Sqn.—During August, 1942, this officer took part in an air attack on an enemy supply vessel, which resulted in its destruction. A few days later, he led a force of torpedo-carrying aircraft in an attack on another supply vessel. Although it was escorted by a destroyer, F/O. Grant led his formation into close range and sank the supply ship.

Act. Flt. Lt. W. H. BALDWIN, R.C.A.F., No. 405 (R.C.A.F.) Sqn.—Flt. Lt. Baldwin is a navigator of exceptional ability which, combined with his courage and initiative, has contributed materially to the success of the operations in which he has participated. Since October, 1941, he has taken part in attacks on industrial targets in Germany, including a flight to Berlin, and on seaport towns and submarine bases.

P/O. H. J. CARTER, R.A.F.V.R., No. 156 Sqn.—This officer has displayed outstanding ability as a navigator. He has participated in numerous sorties over heavily defended areas, including Essen, Bremen and Cologne; he has also com-

R.A.F. uniforms appear to be in the majority in this photograph taken at Buckingham Palace during a recent Investiture.

SERVICE AVIATION

pleted several mine laying operations. By his technical skill and devotion to duty he has contributed materially to the successes achieved.

P/O. A. CHAMBERS, R.A.F.V.R., No. 7 Sqn.—This officer is employed as a wireless officer, but continues to take his turn on operational sorties. He has participated in attacks on targets in the Ruhr area and others in enemy-occupied France. On one occasion his aircraft was attacked by enemy fighters and the wireless and electrical system was rendered unserviceable. P/O. Chambers, however, skilfully repaired the wireless, thus materially contributing to the safe return of his aircraft. On another occasion, when acting as mid-upper gunner, he damaged an enemy aircraft, causing it to break off its attack.

P/O. S. J. CYBULSKI, R.C.A.F., No. 420 (R.C.A.F.) Sqn.—This officer has completed all his operational tasks skilfully and with great determination. On many occasions difficulties have been encountered, but P/O. Cybulski has shown great perseverance and determination to reach his objective. He has participated in attacks on the majority of the enemy's most important targets. On one occasion he returned with two excellent photographs of the target area.

Anti-invasion Patrols

P/O. D. GAUNTLETT, R.A.F.V.R., No. 206 Sqn.—This officer has displayed high skill and continuous devotion to duty in the performance of his tasks, involving escort duties, sweeps, anti-invasion patrols and reconnaissances. In January, 1941, and again in March, 1941, he rendered valuable service in frustrating the efforts of Ju.88 aircraft to attack his convoy. On one occasion in December, 1941, during a raid on the oil plant at Donges, his aircraft was extensively damaged, but P/O. Gauntlett, who was acting as pilot, coolly and skilfully flew it safely back to base after a flight lasting for eight hours.

On another occasion, in July, 1942, P/O. Gauntlett was the navigator of an aircraft detailed to undertake a daylight patrol. After completing a special task, three armed ships were attacked from almost sea level, in the face of machine-gun fire at point blank range. Hits were obtained on the largest ship, which was later observed to be on fire. Although the aircraft was damaged, P/O. Gauntlett's skilful navigation was of the greatest assistance to his pilot, who subsequently flew it safely back to this country after a flight of 7¼ hours' duration.

P/O. P. T. L. HALLETT, R.A.A.F., No. 460 (R.A.A.F.) Sqn.—This officer has displayed a fine fighting spirit and determination to complete his allotted task. Since joining this squadron in March, 1942, he has carried out attacks on many important targets, including Emden, Essen, Hamburg, Rostock and Warnemunde.

P/O. L. S. HAMMOND, R.C.A.F., No. 114 Sqn.—P/O. Hammond has proved himself to be a capable and courageous wireless operator/air gunner. On September 15th, 1941, he was the leading gunner of a formation of three Blenheims which attacked a convoy of seven merchant vessels. During the action the formation was attacked by two Me.109s, but P/O. Hammond's fire control was so successful that, following the first attack, the enemy fighters hesitated to come in closer than 200 yards. His formation was able to reach base with no more than slight damage sustained. In the low level attack on Herdla P/O. Hammond used his guns most effectively on the German ground staff and gun emplacements, causing considerable damage and loss of life to the enemy.

P/O. H. A. HITCHCOCK, R.A.F.V.R., No. 408 (R.C.A.F.) Sqn.—This officer has proved himself to be a most successful navigator. Operating in all kinds of weather and against most of the main targets in Germany and German occupied territory, his determination to achieve success has been outstanding.

P/O. B. A. KNYVETT, R.A.A.F., No. 150 Sqn.—This officer has a fine record of achievement. His courage, skill and determination in action have been an inspiration to his crew. He has taken part in 13 raids on the heavily defended areas of the Ruhr, pressing home his attacks with the utmost determination and with complete disregard for any opposition or his own personal safety.

P/O. P. E. M. LEITH, R.C.A.F., No. 405 (R.C.A.F.) Sqn.—This officer has always displayed the greatest determination to complete his allotted task. He is a painstaking and meticulous observer whose excellent work has contributed largely to the success of many of the operations in which he has participated. His coolness under all circumstances has set a most praiseworthy example. Amongst the many targets he has attacked are such important places as Berlin, Wilhelmshaven, Bremen, Essen and Emden. He also took part in the highly successful attack on Lubeck, and some time afterwards in the attack on Poissy.

P/O. S. G. MATKIN, R.A.F.V.R., No. 7 Sqn.—A cool, determined and courageous captain, this officer has participated in numerous sorties, some of them on the German battle cruisers in Brest; he also took part in a daylight attack on the same target. He has bombed many industrial targets in Germany such as Berlin, Hanover, Bremen, Essen and Cologne. P/O. Matkin is a pilot of exceptional ability, and he has greatly helped in instructing new pilots in the squadron.

P/O. I. C. B. SLADE, R.A.F.V.R., No. 115 Sqn.—This officer has completed many attacks on most important targets. On the night of July 2nd, 1942, he captained an aircraft detailed to attack Bremen. Having successfully accomplished his mission, he had just crossed the Dutch coast when his aircraft was heavily subjected to fire from two armed ships. The hydraulic system was rendered unserviceable, undercarriage, bomb doors and flaps falling down; the rear turret and the elevators were also damaged. Almost immediately an attack was made by a Ju.88. Further damage was sustained, and a fire of alarming proportions broke out near the main spar, and was only extinguished after considerable difficulty by two other members of the crew.

The aircraft was now only 200 feet above the sea, and the position seemed hopeless, but P/O. Slade was determined to fly on as far as possible towards this country. Displaying superb skill, he succeeded in reaching an airfield, where he successfully crash landed his damaged aircraft. Though young in years, this officer has shouldered the responsibilities of operational captain in the manner of a veteran.

F/O Stenborg, D.F.C., who has ten enemy aircraft to his credit. He was also shot down himself and went into a dive at 27,000ft. He was unable to jettison his hood until his aircraft reached 13,000ft. when he was flung out of the aircraft while travelling at over 400 miles an hour. He was picked up in the sea five miles from Malta.

Shipping Attacks

F/O. L. V. WORSDELL, R.A.F.V.R., No. 39 Sqn.—This officer has participated in several successful attacks on enemy shipping. In September, 1942, he led a formation against a convoy of four merchant vessels, escorted by eleven destroyers and a number of aircraft. Despite this formidable opposition, the objective was attacked from close range. Afterwards, when his aircraft was attacked by enemy fighters, F/O. Worsdell, by skilful tactics, prevented them from causing damage to his aircraft. On a previous occasion, following an attack when enemy shipping was sunk, F/O. Worsdell saw one of his fellow pilots in difficulties with engine trouble. Despite the presence of enemy fighters, F/O. Worsdell remained to protect his comrade and escorted him back to base.

F/O. J. L. WADDY, R.A.A.F.—This officer, when participating with a force which intercepted about 20 enemy aircraft, destroyed two Ju. 52's and two Me. 110's. In more recent sorties F/O. Waddy has destroyed four other enemy aircraft, bringing his total victories to at least 11.

P/O. R. S. O. MARSHALL, R.A.A.F., No. 39 Sqn.—This officer has taken part in several successful raids on enemy shipping. In June, 1942, he participated in an attack on an Italian naval force. Although his aircraft was severely damaged by anti-aircraft fire, he flew it back to base. In September, 1942, he participated in an attack on a convoy of four merchant vessels, heavily escorted by 11 destroyers and fighter aircraft. In spite of this formidable opposition, P/O. Marshall released his torpedo from close range. His aircraft was damaged by fire from enemy fighters, but he evaded them and flew safely to base.

P/O. J. S. WATT, R.A.F.V.R., No. 7 Sqn.
P/O. W. E. KING, R.C.A.F., No. 7 Sqn

One night in September, 1942, P/Os Watt and King were captain and navigator respectively

Sqn. Ldr. D. Carlson, No. 154 Squadron, recently awarded the D.F.C. The official citation appeared in our issue of October 1st.

of an aircraft detailed to attack Dusseldorf. When nearing the target area, the aircraft was held in a concentration of searchlights and hit by anti-aircraft fire. The inter-communication was rendered unserviceable and P/O. King was wounded in the leg and stomach. Despite this, he bravely continued his duties. His subsequent navigation was of the greatest assistance to P/O. Watt, who succeeded in flying his damaged aircraft back to this country.

Wing Cdr. H. L. DAWSON, R.A.F.O.—This officer led sorties and participated in six sweeps over Northern France before proceeding to Malta. He has at all times displayed the greatest keenness and initiative.

Wing Cdr. W. A. A. DE FREITAS (deceased), No. 70 Sqn. Awarded with effect from December 19th, 1941.—This officer has completed 47 operations against the enemy in the Middle East. On one occasion when carrying out an attack on Barce, in the face of heavy fire from the Benghazi defences, he made eight runs over the target before releasing his bombs. He scored a direct hit on the hangars and petrol installations. Wing Cdr. de Freitas has consistently obtained good results, and has caused endless damage to the enemy.

P/O. D. SLOAN, No. 614 Sqn.—On August 19th, 1942, this officer was the rear gunner of the leading aircraft of a formation of five detailed to lay a smoke-screen at Dieppe. Whilst over the target area, intense light anti-aircraft fire was encountered and, as the aircraft was being flown in line astern at 50 feet, it was difficult for the pilot to take avoiding action. However, P/O. Sloan, skilfully handling his guns, fired continuously and effectively and thus prevented the following aircraft from becoming another target for the enemy's anti-aircraft gunners.

Sqn. Ldr. T. O. PRICKETT, R.A.F.O., No. 148 Sqn.—In the course of his sorties, Sqn. Ldr. Prickett has attacked targets in the Western Desert, Greece, Crete and Sicily. He went with a detachment to Malta when the island was receiving its heaviest air attacks. On two successive nights he carried out sorties against Comiso; he has made ten sorties against Benghazi.

Act. Sqn. Ldr. G. R. A. MCGAREL JOHNSTON, R.A.F.V.R., No. 73 Sqn.—Sqn. Ldr. Johnston has destroyed four enemy aircraft.

Act. Sqn. Ldr. C. N. OVERTON, R.A.F.O., No. 145 Sqn.—Sqn. Ldr. Overton has destroyed at least five enemy aircraft.

Act. Sqn. Ldr. W. M. PROTHEROE (deceased), No. 158 Sqn. Awarded with effect from March 15th, 1942.—This officer, an extremely efficient pilot and captain, completed many attacks on important targets, including Cherbourg, Emden, Brest, Kiel, Essen and Lubeck.

Long-range Reconnaissance

Flt. Lt. A. H. W. BALL.—Flt. Lt. Ball has completed several long-range reconnaissances, including flights over Berlin, Munich and Stuttgart.

Flt. Lt. V. R. H. FERGUSON, R.A.F.V.R.—This officer has completed numerous successful reconnaissances. His results have been consistently good.

Flt. Lt. J. L. G. GLAISTER.—This officer has successfully completed many sorties in difficult conditions.

Act. Flt. Lt. G. J. BLACK, R.A.F.V.R., No. 260 Sqn.—This officer has been actively engaged with the squadron since June, 1941. He recently assumed command of his flights in difficult circumstances.

Act. Flt. Lt. J. L. GRIFFITH, R.A.F.V.R.—This

SERVICE AVIATION

officer has carried out a large number of sorties, thirty of which were on reconnaissance in the Libyan area. He has been instrumental in picking up seventeen members of Wellington crews who had force landed. On the last occasion, after locating the crew of a Wellington on the ground some thirty miles from Sidi Barrani in enemy territory, he succeeded in rescuing all six members. He flew back to base with ten persons in his aircraft. On another occasion he saved five members of a Wellington crew from the Quattara Depression.

DISTINGUISHED FLYING MEDAL

Sgt. L. H BAVEYSTOCK, No. 50 Sqn.
Sgt. A. McF. MILLS, No. 50 Sqn.
Sgt. B. W. NAYLOR, No. 50 Sqn.

These airmen, as members of the crew of an aircraft, in hazardous circumstances, displayed courage, determination and devotion to duty in keeping with the highest tradition of the R.A.F.

Flt. Sgt. W. T. BENT, R.C.A.F., No. 142 Sqn.—One night in September, 1942, Flt. Sgt. Bent, as captain of an aircraft, was detailed to attack a target in the Ruhr. Just before reaching the target engine trouble developed, and Flt. Sgt. Bent was unable to fly the aircraft at above 2,000 feet. Nevertheless, displaying great courage and fortitude, he continued his mission, and, after bombing his target, a successful photograph of the area was taken. On the return journey the engine trouble persisted, and Flt. Sgt. Bent was considerably harassed by searchlights and anti-aircraft fire. By skilful airmanship, however, he succeeded in returning to base safely.

Flt. Sgt. R. D. DYSON (R.A.A.F.), No. 450 (R.A.A.F.) Sqn.—Flt. Sgt. Dyson is a keen and determined pilot, who has led his section with skill. He has destroyed at least two and damaged several more enemy aircraft.

Flt. Sgt. D. C. MACNAB (R.C.A.F.), No. 148 Sqn.—This wireless operator has participated in operations against targets in Germany, the Western Desert, Greece, Crete and Sicily, and since May, 1942, he has acted as signals leader in the squadron.

Flt. Sgt. A. NELSON (S.A.A.F.), No. 12 (S.A.A.F.) Sqn.—As wireless operator-air gunner this airman has flown in both Maryland and Boston aircraft. As a wireless operator, he has no peer in the squadron.

Low-level Attacks

Flt. Sgt. J. PRICE, No. 38 Sqn.—This air gunner participated in operations from this country prior to being posted to the Middle East. His skill as a gunner has contributed much to the success of many low-level machine-gun attacks against a variety of targets.

Flt. Sgt. A. E. TURLEY, No. 37 Sqn.—This navigator/bomb aimer has participated in attacks against targets in Cyrenaica, Tripolitania, Sicily, Crete, and the Dodecanese.

Flt. Sgt. W. N. WHALLEY.—In March, 1942, this airman was the observer of an aircraft detailed to make a photographic reconnaissance of Danzig and Gdynia to locate enemy naval units. Much success was achieved and photographs were obtained. Flt. Sgt. Whalley was responsible for the taking of the photographs as well as the navigation.

Sqn. Ldr. Huang, Chinese Air Attaché, in conversation with Air Marshal Garrod.

Sgt. F. ALLISON, No. 70 Sqn.—This captain of aircraft has achieved much success in his operational sorties against a variety of objectives. Despite difficulties and regardless of the dangers involved he has always pressed home his attack.

Sgt. L. L. BOARDMAN (R.A.A.F.), No. 3 (R.A.A.F.) Sqn.—This airman has led numerous sweeps over enemy concentrations during the recent fighter-bomber operations. His courage, daring and skill in pressing home accurate and devastating attacks, despite intensive opposition from ground defences, have been an inspiration to others. Owing to his skill he has repeatedly been detailed to lead formations on tactical reconnaissances and the reports obtained have been of the highest value. He has destroyed one enemy aircraft.

Sgt. A. C. CAMERON (R.A.A.F.), No. 3 (R.A.A.F.) Sqn. Awarded with effect from January 10th, 1942.—This airman has served with the squadron during the operations in Syria and in the Libyan campaign In January, 1942, his squadron was engaged on a patrol north-east of Agedabia when a force of 16 Ju.87s, accompanied by six Me.s, were observed heading in the direction of our forward troops. The squadron attacked and dispersed the enemy fighters, whereupon the bombers jettisoned their bombs. During the combat Sgt. Cameron pursued a Me., but owing to poor visibility, caused by a sandstorm, he was later unable to make contact with the squadron. Realising that the enemy would probably return to Agedabia, Sgt. Cameron flew on and waited for their return. His strategy proved entirely successful, for, when the enemy aircraft returned to Agedabia he shot down two, probably destroyed a further two and damaged another of them. He has destroyed at least seven and probably destroyed or damaged six more.

Sgt. K. G. ELCOATE, No. 148 Sqn.—This airman pilot has taken part in operations against Germany, the Western Desert, Greece, Crete and Sicily. One night in June, 1942, he was captain of one of the bombers detailed to drop flares on Benghazi to provide illumination for an attack on the port by heavy bombers. Despite most intense defensive fire, Sgt. Elcoate succeeded in his mission and thereby contributed much to the great success achieved by the bombing force.

Sgt. R. T. JENKINS, No. 38 Sqn.—Sgt. Jenkins, as wireless operator, completed many sorties against targets in Germany prior to his posting to the Middle East, where he has been engaged in operations both from Malta and Egypt. His exceptional skill as a wireless operator and his keenness and devotion to duty under the most adverse conditions have set a high example.

Sgt. E. K. KILDEY (R.A.A.F.), No. 3 (R.A.A.F.) Sqn.—During a period of intensive operations from May 25th to June 1st, 1942, when the squadron was engaged in bombing and machine-gunning enemy troops and concentrations, Sgt. Kildey carried out seven determined sorties. He has destroyed one enemy aircraft.

Sgt. L. D. LEGGETT (deceased), No. 44 (Rhodesia) Sqn. Awarded with effect from December 12th, 1941.—Since June, 1941, this airman has taken part in numerous operational sorties against most of the important enemy targets. He is a most efficient wireless operator/air gunner. On a number of occasions he has machine-gunned ground targets and shipping.

Sgt. H. L. MOISLEY (R.A.A.F.), No. 12 (R.A.A.F.) Sqn.—Sgt. Moisley is a most experienced observer. He has flown both in Marylands and Bostons, and his excellent work has contributed in a large measure to the sucesses obtained. His high standard of navigation in night operations has been noteworthy.

Sgt. J. A. PLUMSTEAD, No. 37 Sqn.—This captain of aircraft has maintained an exceedingly high standard of determination, skill and thoroughness in his operational duties, which have involved attacks on objectives in Greece, Cyrenaica, Tripolitania, Crete and the Dodecanese.

Italian Targets

Sgt. R. A. VAN WALWYK, No. 40 Sqn.—This airman has participated, as a rear gunner, in numerous attacks, which have included targets at Brindisi, Naples, Catania, Tripoli, Tobruk and Benghazi. In addition he has attacked enemy shipping, transport, and concentrations. Every duty assigned to him has been completed with brilliant success.

Flt. Sgt. J. O. DALLEY, No. 69 Sqn.—Flt. Sgt. Dalley has completed a large number of operational sorties. In September, 1942, after locating an important enemy convoy in the Mediterranean, his aircraft developed engine trouble. Displaying great courage and fortitude, whilst faced with the grave risk of having to alight in the sea with little prospect of being rescued, he elected to fly his aircraft for approximately 400 miles over sea direct to his base.

Sgt. J. C. BALDWIN.—One night in September, 1942, Sgt. Baldwin, who was engaged on his first operational sortie as captain of a bomber, was detailed to attack targets in the Ruhr. Despite intense anti-aircraft fire he succeeded in locating and bombing his target. Immediately afterwards his aircraft was subjected to intense and accurate anti-aircraft fire; the aircraft was thrown almost on to its back, the wireless set was rendered unserviceable, and one engine was damaged. The bomber was rapidly becoming uncontrollable, when it was hit again and all the pyrotechnics were set on fire. Nevertheless, displaying great courage and fortitude, Sgt. Baldwin regained control, set course for home, and ultimately made an excellent crash landing on an airfield.

Sgt. D. B. GIBSON, No. 106 Sqn.—This airman is employed as wireless operator-air gunner. In 1940 Sgt. Gibson completed many sorties involving attacks on troops and transport concentrations during the fighting in France and various objectives in the Ruhr, Leuna, Leipzig and Berlin. He has continued to display both courage and abilty in the performance of his tasks. Among his many missions are sorties against the enemy naval ports, Essen, Rostock and Warnemunde.

P/O J. D. Rae, who has six enemy aircraft to his credit. He was himself shot down, a cannon shell blowing the control column from between his legs. He baled out safely and landed on Malta, wounded in the leg. Subsequently he met in hospital the Sudeten Czech who shot him down.

Sgt. J. GILMOUR, No. 207 Sqn.—On July 11th, 1942, Sgt. Gilmour was first wireless operator-air gunner of an aircraft which participated in a daylight raid on the submarine works at Danzig. Extremely bad weather and severe icing were encountered and the aircraft became badly off course. Despite these difficulties, and although the aircraft was 720 miles from base, Sgt. Gilmour obtained a loop bearing and continued to obtain bearings on the whole of the return journey. By his efficiency, perseverance and determination, this airman contributed in a large way to the safe return of his aircraft. He has participated in many other missions, including sorties against Berlin, Lorient, Kiel, Essen and Hamburg.

Sgt. C. MILLER, No. 102 Sqn.—As wireless operator-air gunner this airman has completed numerous sorties over Germany and enemy occupied territory. His wireless ability has been of the utmost value. He has always displayed great determination and has set a most inspiring example. Amongst various targets attacked are Kiel, Brest, Bremen, Cologne, and many others equally important.

Sgt. R. MILLER, No. 150 Sqn.—Both as pilot and captain of aircraft this airman has shown outstanding ability. He has completed numerous sorties and has invariably pressed home his attacks with the utmost determination irrespective of opposition. During his last two sorties his crews were particularly requested to obtain good photographic results and, in both cases, Sgt. Miller remained in the target area until he was sure of achieving success. He has taken part in attacks on many important objectives, including targets at Brest, Essen, Hamburg Cologne, Bremen and Wilhelmshaven. He has also completed two mine-laying missions.

Sgt. T. J. O'DONOHUE, R.A.A.F., No. 460 (R.A.A.F) Sqn.—As observer, this airman has displayed high skill and devotion to duty. Amongst other successes he took part in a very successful attack on the Matford Works at Poissy when he obtained hits on the target with heavy bombs. On the night of April 12th, 1942, when returning from a raid on the Ruhr, his aircraft was attacked by an enemy fighter and severely damaged. Sgt. O'Donohue was wounded in the leg, but, despite considerable pain, he remained at his post and skilfully navigated his aircraft back to the English coast.

Sgt. A. C. PEARSON, No. 150 Sqn.—As air observer Sgt Pearson has completed numerous sorties against the majority of the enemy's most important targets, including one daylight attack against a target in the Ruhr. His navigational skill, together with his unconquerable spirit of determination to achieve success, has inspired a great confidence in the crews with whom he has flown. On many occasions he has navigated his aircraft in extremely adverse circumstances and his co-operation, coolness and devotion to duty has contributed materially to the safe return of his aircraft.

A Petty Officer Pilot of the Fleet Air Arm alighting from his Hurricane.

Roll of Honour

Casualty Communiqué No. 167.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Royal Air Force

KILLED IN ACTION.—Sgt. M. H. Beaufoy; Sgt. B. B. Camlin; Sgt. A. A. Conisbee; Sgt. F. O. Cooke; Sgt. J. J. Dixon; Sgt. L. W. Flowers; P/O. J. S. Graham; Sgt. D. G. Green; Sgt. F. R. Grosvenor; Sgt. L. F. Harrowell; Sgt. E. Kitcher; Sgt. D. W. Norman; Sgt. B. C. Slowly; Sgt. J. M. Wallbridge.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. C. E. O'Neill.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. B. J. Burden; Flt. Sgt. D. L. Hindle; P/O. F. H. McGrath; Sgt. W. A. Wright.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. D. Broadhurst.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. F. R. Arthan; Flt. Lt. H. Connolly; Sgt. W. G. Cormack; Act. Flt. Lt. N. J. Edwards; Sgt. D. Hanlon; Sgt. H. J. M. McDonnell; Flt. Lt. M. G. Robin; Sgt. H. Smith; Sgt. W. G. Thomson; Sgt. R. J. C. Young.

MISSING.—Sgt. F. Armstrong; P/O. G. H. Baker; Sgt. L. C. Bray; Sgt. F. G. Brown; Sgt. R. A. Brown; P/O. S. Brown; Sgt. R. Burges; Sgt. J. E. Burley; Sgt. G. A. Burrell; Sgt. F. Chapman; Sgt. H. E. Chapman; Sgt. J. D. M. Cliff; Sgt. V. Comer; Cpl. D. J. Crossley; Sgt. G. Daft; Act. Flt. Lt. P. A. Dalton; Sgt. J. W. Davis; P/O. P. Dawson; Sgt. I. Duncan; Sgt. W. McF. Drummond; Sgt. J. Easting; Sgt. S. D. England; Sgt. J. Everitt; Sgt. R. J. G. Fairweather; Sgt. F. E. Flint; Sgt. A. T. Fraser; P/O. A. L. Gaskin; Sgt. K. J. Gill; R. G. Greenman; Sgt. R. E. P. Grieve; P/O. G. J. Hains; Wing Cdr. P. G. Heath; P/O. D. Hellyer; Sgt. J. C. Higham; Sgt. V. C. Howick; Sgt. W. R. Hunt; Sgt. R. C. Hutton; Sgt. E. Jackson; Act. Flt. Lt. A. W. I. Jones; Sgt. F. J. Keen; Sgt. J. Kneeshaw; P/O. A. J. Knell; Sgt. A. C. P. Knowles; Sgt. N. H. Kortright; P/O. R. W. Lawrence; P/O. E. F. Lloyd; A/C.1 H. K. McCombie; Act. Sqn. Ldr. T. C. McGillivray; Sgt. J. McGovern; Sgt. A. J. McHardy; Sgt. J. McI. McLaren; L.A/C. G. McL. McNeill; Act. Flt. Lt. W. R. Maitland; Sgt. E. J. Morris; Sgt. T. E. Murray; Sgt. D. R. Newbury; Sgt. W. R. Nugent; W/O. J. A. Nutt; Flt. Lt. C. T. Oakes; Sgt. R. E. Parrack; Sgt. J. Parris; Sgt. R. L. Prosser; Sgt. D. J. Raynes; Cpt. T. Robertson; P/O. F. W. Roe; Cpl. J. Rooney; Sgt. D. Rose; Sgt. D. K. N. Scott; P/O. G. E. Shepphard; Sgt. F. H. Slatford; Sgt. W. A. Smith; Sgt. D. G. Southwell; Sgt. F. G. Spenceley; Sgt. C. C. Stevens; Sgt. S. R. Sticknev; Sgt. L. G. Still; Act. Flt. Lt. W. L. Tweedie; P/O. E. F. Valentine; Act. F/O. R. W. Valters; Sgt. E. D. Walters; A/C.1 H. T. Ward; Sgt. D. J. W. Watson; Sgt. C. J. Whalley; Act. Flt. Sgt. D. J. Whalley; Flt. Sgt. K. V. Whelan; Sgt. J. W. Williams.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—W/O. S. W. Merryweather.

KILLED ON ACTIVE SERVICE.—Sgt. R. J. Andrew; Sgt. C. S. Bassett; P/O. D. J. D. Berrington; A/C.2 B. C. F. Bicknell; Act. Sgt. H. E. Boyce; Sgt. E. A. Brace; Act. Sgt. W. C. T. Brown; Sgt. L. W. Coote; L.A/C. B. D. G. Dear; P/O. L. W. Dorney; L.A/C. H. G. Foot; Act. Sgt. R. Golland; L.A/C. J. Griffiths; L.A/C. E. G. Gulliver; L.A/C. H. G. Henry; Sgt. G. E. Hibben; Act. Flt. Lt. C. D. Hunt; L.A/C. L. Hutt; Sgt. B. E. F. Jones; Sgt. N. C. Keenan; Flt. Sgt. J. Knox; Sgt. V. G. Lambert; L.A/C. G. A. Layton; L.A/C. A. V. Lowe; Flt. Sgt. G. Millar; L.A/C. E. C. P. Moore; A/C.2 J. Murray; Sgt. H. F. Myles; Sgt. W. Overend; W/O. W. Peirson; F/O. A. M. Phillips; Sgt. K. Ramsdale; Sgt. B. E. Rooke; P/O. L. Rowlinson; Flt. Sgt. W. F. Rushton; L.A/C. J. Russell; Sqn. Ldr. R. J. Sansom; Sgt. J. E. Smee; Sgt. E. M. Taylor; Flt. Sgt. I. Telfer; P/O. C. E. Vincent; Sgt. W. W. Webster; P/O. D. C. White; P/O. E. L. Williams; Sgt. A. E. Willis; L.A/C. R. D. S. Yeaman.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. A. V. Abbott; Sgt. R. G. Burton; Sgt. A. V. Henshaw; A/C.2 A. E. Keep; A/C.1 S. J. Leeburn; L.A/C. J. S. McIvor; L.A/C. R. I. Ramsden; Sgt. J. J. Taylor; Sgt. P. F. Woolland.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. R. W. Bevans; Sgt. F. H. Bouchard.

DIED ON ACTIVE SERVICE.—Flt. Sgt. A. Francis, D.F.M.; Sgt. J. Fulton; A/C.1 P. E. J. Jackman; A/C.2 W. O'Neill; L.A/C. A. R. Thomas; L.A/C. A. F. West.

Lady Sinclair presenting the R.A.F. Gardens Competition Trophy to the 1942 winners. The trophy was presented by the Friends of the Fighting Services, Pennsylvania, and 278 units entered for the competition.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTON, NOW PRESUMED KILLED IN ACTION.—P/O. V. L. Bailey.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. C. Beckley.

MISSING.—Sgt. M. Anivitti; Sgt. K. H. England; P/O. J. M. Henderson; Sgt. F. D'O. Hunter; Sgt. L. H. James; Sgt. D. G. Kitchen; Sgt. G. L. Stevens; Sgt. H. G. Waddell; Sgt. R. E. Warren.

KILLED ON ACTIVE SERVICE.—Sgt. D. J. Drake-Brockman; Sgt. L. J. Hands; Sgt. F. A. Paul.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. B. C. Dickson; Sgt. R. A. Milliken.

Royal Canadian Air Force

KILLED IN ACTION.—P/O. W. C. Wigston.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. E. A. Bland; Sgt. C. H. Challis; Sgt. C. Collard; F/O. R. C. Macquoid; Sgt. W. D. F. Ross; Sgt. J. Scroggie.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. R. Davidson; P/O. A. L. Kippen.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. M. H. Buckley; Sgt. W. P. McCarthy; F/O. C. F. Race; P/O. R. M. D. Robinson.

MISSING.—Sgt. D. G. Barrie; W/O. W. R. Davies; P/O. P. R. Eakins; Sgt. G. H. Ellis; Sgt. G. Kennedy; Sgt. N. MacDougall; Sgt. D. Mathieson; Sgt. B. D. Nidelman; Flt. Sgt. F. G. Peebles; Sgt. R. A. Post; Flt. Sgt. J. H. Rowney; Sgt. B. Strachan; P/O. J. E. Sumpton; Flt. Sgt. C. P. Veysey.

KILLED ON ACTIVE SERVICE.—Sgt. A. F. Alcock; Sgt. T. H. Campbell; P/O. J. P. Doncaster; Sgt. O. N. Elwell; Sgt. E. J. Nelms; P/O. J. G. Power; P/O. J. H. Smith.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. J. Ross; F/O. H. D Stuart.

DIED ON ACTIVE SERVICE.—Sgt. J. W. C. Cowan.

Royal New Zealand Air Force

MISSING.—Sgt. W. J. Barnes; Flt. Sgt. K. C. Brown; Sgt. D. G. Graill; Sgt. J. T. Heurtley; Sgt. J. N. McConnell; Sgt. T. B. Pepper; Sgt. H. W. Pike; F/O. J. Pybus; Flt. Sgt. D. H. Reed; Flt. Sgt. L. P. Russell; Sgt. J. H. Tanner.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. H. Kay.

South African Air Force

WOUNDED OR INJURED ON ACTIVE SERVICE.—2/Lt. W. J. A. Chippendall; Air Sgt. R. A. Pepper.

Indian Air Force

KILLED ON ACTIVE SERVICE.—F/O. K. R. Das.

Casualty Communiqué No. 168.

Royal Air Force

KILLED IN ACTION.—Sgt. D. Boddy; Sgt. J. A. Bond; Sgt. J. Brett; W/O. A. C. Bryce; Sgt. J. W. Coad; Sgt. G. R. Croasdell; Sgt. R. G. Davies; Sgt. C. A. Downing; Sgt. A. S. Draper; Sgt. G. H. Evaratt; Sgt. P. C. Fussell; Sgt. D. N. L. Harwood; Sgt. H. Hooley; Sgt. H. C. Horsfield; Sgt. A. G. Hutchinson; Sgt. A. E. Johnson; Sgt. H. Maclean; Sgt. G. D. Nicholls; P/O. A. J. Pedden; Sgt. F. W. Potts; Sgt. G. C. Roberts; P/O. C. C. Rowe; Sgt. T. Sleeman; Sgt. A. Smith; Sgt. W. T. Stanley; Sgt. G. Wale; Flt. Sgt. W. L. J. Young.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. J. S Brayshaw; Flt. Sgt. S. Davy.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. C. A. Blackwell; Sgt. T. J. Isaac; Sgt. T. O'Shea; Sgt. E. T. Webb.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. W. C. Boyles; Flt. Lt. P. T. Candler; Flt. Sgt. J. S. Clapham; Sgt. J. R. Cowan; Sgt. C. N. Dixon; Sqn. Ldr. C. L. Gilbert; P/O. W. E. Gregory; Flt. Sgt. J. T. Healey; Sgt. G. Houghton; P/O. C. Lewis; Sgt. N. A. Lowden; Sgt. L. W. Mallow; Sgt. K. R. Mellowes; Flt. Sgt. A. H. Mercer; P/O. F. A. Mitchell; Flt. Sgt. T. A. G. Morris; P/O. L. Newton; Sgt. D. H. Normington; Sgt. W. H. Orman; P/O. R. D. Pegram; Act. Flt. Lt. H. G. Pilling; Flt. Sgt. T. Rankin; Sgt. G. Roberts; P/O. J. F. V. Saunders; Sgt. J. Simpson; Sgt. F. W. Thornton; Sgt. C. W. Turner.

MISSING.—Sgt. S. M. Angelo; Sgt. H. E. W. Ansell; Sgt. S. Arnett; Sgt. W. H. Arnold; Sgt. C. A. Bell; Sgt. O. P. Beswick; Sgt. W. G. Bond; Flt. Sgt. F. Booth; Sgt. H. Bottomley; P/O. R. A. Bowker; Sgt. A. T. Brunton; Sgt. C. J. Bunn; Sgt. B. Cain; Sgt. W. E. Chambers; Sgt. W. L. Crowther; Sgt. C. J. Crozier; Act. Sgt. R. A. Currie; Sgt. H. Doughty; P/O. F. K. Doyle; P/O. K. B. Dyer; P/O. E. Evans; P/O. R. L. W. Ferrer; Sgt. J. F. Ford; P/O. A. De F. Gardner; Sgt. R. E. Hart; Flt. Sgt. N. R. Hartley; Sgt. W. Helliwell; A/C.2 J. W. Holman; P/O. J. E. Hope; Sgt. J. E. Hughes; Sgt. G. Jefferies; Sgt. G. F. Jenkins; Sgt. I. C. McKeand; Flt. Sgt. A. MacN. McKelvie, D.F.M.; Sgt. E. W. Macsparron; Flt. Sgt. E. S. Masson; A/C.2 C. Mather; Sgt. D. Miller; Sgt. F. A. Morris; Flt. Sgt. F. D. L. Oakwell; Sgt. F. E. Patchett; Sgt. R. McI. Paton; Sgt. D. Pearson; A/C.1 B. E. Perkins; Sgt. W. A. Smith; Sgt. I. B. H. Spooner; A/C.2 J. D. Spurgeon; A/C.2 R. S. Staples; A/C.1 P. E. Ward; Sgt. G. S. Watson; Flt. Sgt. H. H. Witts.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—L.A/C. H. Allen; P/O. R. E. Clark,

SERVICE AVIATION

D.F.M.; Sgt. R. B. Duncombe; Sgt. G. Hardy; A/C.2 D. D. Lindsay.

KILLED ON ACTIVE SERVICE.—Sgt. L. Branton; Sgt. R. J. Brewer; Sgt. E. Brocklebank; Sgt. E. A. Clack; Sgt. A. Clitheroe; P/O. G. E. Cryer; Sgt. H. Dawson; Sgt. A. H. Dingley; Sgt. D. D. Dunlop; Sgt. V. A. East; Sgt. D. E. Evans; Sgt. G. H. J. Evans; Sgt. B. E. Evanson; A/C.2 J. Farrugia-Gay; Cpl. E. Faulkner; Sgt. G. R. Fennell; Sgt. J. F. Gooder; Sgt. W. Gradwell; Flt. Lt. G. R. Hall; Sgt. G. Harman; P/O. J. Hayward; Act. Sgt. M. R. J. Heath; Sgt. F. R. Heaton; A/C.2 L. S. Honeker; Sgt. T. L. Jacobs; Sgt. E. A. Jefferson; Sgt. H. Johns; Sgt. J. K. Jones; L.A/C. E. A. Langley; Sgt. J. Lascelles; Sgt. G. F. Lock; Sgt. A. H. McFall; P/O. A. F. McManemy; Sgt. E. T. Massam; Sgt. Q. S. Moore; Cpl. A. Raine; Sgt. G. Ryan; Flt. Sgt. E. V. Shaw; Sgt. D. W. Shirley; L.A/C. L. B. Vincent.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. J. D. Cook; Sgt. H. E. Elliott; Sgt. B. A. Marks; P/O. H. J. Randall; Sgt. H. T. Wright.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—A/C.1 E. Foxhall.

DIED ON ACTIVE SERVICE.—A/C.2 C. A. Bennett; A/C.1 R. J. Bent; L.A/C. G. V. Blake; L.A/C. S. R. Blakeley; A/C.1 I. C. H. Black; L.A/C. W. J. Bleeks; Sgt. G. H. Brandon; A/C.2 J. G. Copeland; L.A/C. V. Crosbie; A/C.2 I. W. Davies; A/C.1 T. Dempster; A/C.2 F. J. Hough; Cpl. L. B. Goldwin; A/C.1 R. W. Harder; L.A/C. A. L. John; A/C.2 R. C. Land; Act. Flt. Lt. C. E. A. Milburne; L.A/C. T. V. Platts; Flt. Sgt. A. H. Richards; L.A/C. S. E. Short; A/C.2 C. P. Voltos; Sgt. L. J. Whittaker.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.2 B. M. Dee.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. K. E. Stewart; Sgt. W. J. Taylor.

MISSING, BELIEVED KILLED IN ACTION.—P/O. R. A. Jones; Sgt. R. H. Murphy; Sgt. J. R. Shearer.

MISSING.—F/O. R. B. Archer, D.F.C.; Sgt. D. R. Beinke; Sgt. A. J. Grabham; Flt. Sgt. R. G. K. Holden; P/O. A. A. Waddell; Sgt. T. L. Watkins.

KILLED ON ACTIVE SERVICE.—L.A/C. R. J. Aitken; Sgt. A. L. Chirnside; Sgt. F. J. Leavey; Sgt. O. W. Osborne; L.A/C. W. D. Reid; Sgt. C. Stephen; Sgt. S. A. Unger; Sgt. A. N. Yeaman.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. R. P. Wishart.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. L. D. Brooks; P/O. D. P. McDonald; Sgt. J. D. McKenzie; Sgt. D. M. Moodie.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. R. K. Cox.

MISSING, BELIEVED KILLED IN ACTION.—P/O. J. D. N. Bain; Sgt. W. H. Bracken; Flt. Sgt. W. T. Cormack; Flt. Sgt. K. A. Fogg; Sgt. J. H. Godbehere; Flt. Sgt. G. J. P. Kearns; W/O. H. A. Morris.

MISSING.—P/O. G. H. Chaffey; Sgt. H. R. Copeland; P/O. I. F. Hoidas; Flt. Sgt. F. A. Holmes; F/O. F. J. Kennedy; P/O. A. Lucki; Sgt. J. M. McAleavey; Flt. Sgt. H. H. Marks; Sgt. A. O. Mireau; Sgt. I. MacL. Reid; Flt. Sgt. A. A. Siefert; Flt. Sgt. J. W. Smyth.

KILLED ON ACTIVE SERVICE.—Sgt. G. O. Doten.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. A. Ballinson; Sgt. A. E. Charron.

DIED ON ACTIVE SERVICE.—Flt. Sgt. S. Fleming.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Sgt. A. J. Edward.

MISSING, BELIEVED KILLED IN ACTION.—P/O. D. G. Box; P/O. H. G. Clothier; F/O. J. R. F. Ganderton; Sgt. S. H. Lincoln.

MISSING.—Sgt. W. A. Baird; P/O. W. J. Fulton; Flt. Sgt. D. N. Keeling.

South African Air Force

KILLED IN ACTION.—Major J. L. V. De Wet; 2/Lt. J. S. Dutoit; Air Sgt. W. W. Oliver; 2/Lt. H. Pienaar; 2/Lt. J. H. Pienaar; 2/Lt. F. J. Reed; Air Sgt. S. E. Shipmak; Air Mech. R. J. Swanepoel; Air Mech. J. F. Van Breda; Air Sgt. A. P. Vos; 2/Lt. L. T. H. Wessels.

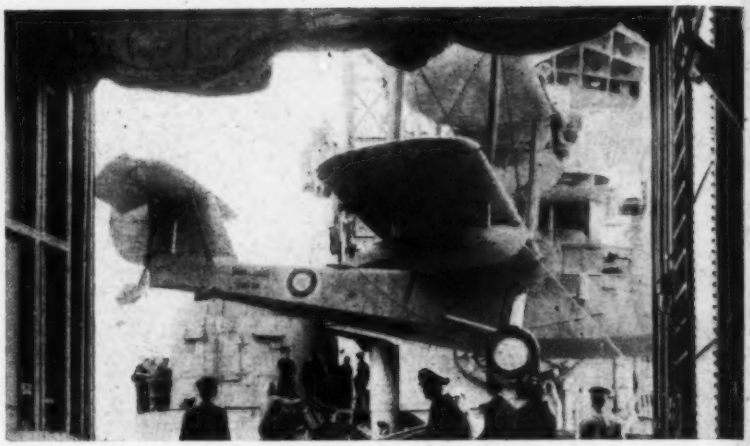
Indian Air Force

DIED ON ACTIVE SERVICE.—Tya Gul.

Casualty Communiqué No. 169.

Royal Air Force

KILLED IN ACTION.—Act. F/O. H. E. Bedford; Sgt. S. Brimer; Sgt. H. K. Bromage; P/O. L. C. Froud; Sgt. D. A. Harsum; Sgt. E. E. Hayes; Sgt. S. M. Moore; Sgt. V. G. Musselwhite; Sgt. G. Nixon; Sgt. J. O'Rourke; Sgt. M. S. J. Waller; P/O. K. B. Willson.



OLD WINE IN NEW BOTTLES: Stowing a Walrus amphibian on board one of the new *Duke of York* class battleships, H.M.S. *Anson* and *Howe*.

WOUNDED OR INJURED IN ACTION.—F/O. F. G. Buckle; Sgt. N. T. Johnson; Sgt. C. J. Lee; Sgt. D. G. Phillips.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. J. P. Carter; P/O. W. F. D. Charlton; Flt. Sgt. A. Crerar; Act. Flt. Lt. W. J. Ewart; Sgt. G. Gascoyne, D.F.M.; Sgt. R. Harris; P/O. M. F. Hughes; P/O. J. O. Little, D.F.M.; Sgt. G. H. Mercer; P/O. R. A. Minchin; Sgt. J. D. O'Sullivan; Sgt. D. L. Overton, D.F.M.; P/O. R. R. H. Rowe; P/O. R. Scriven; Sgt. D. R. Stuart; Sgn. Ldr. D. G. Tomlinson, D.F.C.; Sgt. G. C. Whitfield.

MISSING.—Sgt. N. Acton; Sgt. M. S. Ash; Flt. Sgt. T. F. Beaumont; Sgt. D. Block; Sgt. J. E. Bottomley; Sgt. E. R. Bristowe; P/O. W. F. Caldwell; Sgt. C. G. Campbell; Sgt. E. Chadwick; Sgt. H. F. P. Clark; Flt. Sgt. T. Cook; Sgt. F. G. Crighton; Sgt. T. Cudworth; Act. Sqn. Ldr. P. M. De Mestre; D.S.O., D.F.C.; Sgt. L. Dent; W/O. B. Doyle; Sgt. K. N. Drake; Sgt. K. Edmonds; P/O. F. F. J. Edwards; Sgt. H. R. G. D. Elliott; Flt. Sgt. P. F. P. Enna; Sgt. E. E. C. Evans; Sgt. G. P. Forster; Sgt. L. A. Fussey; Sgt. J. S. Gething; Sgt. L. C. Gray; Sgt. D. S. Halliday; Sgt. C. S. Harding; Sgt. E. Harrison; Sgt. G. C. Haynes; Sgt. D. Henning; Sgt. G. Horner; Sgt. L. J. Hunter; Sgt. R. Hunter; P/O. R. G. Inglis; Sgt. L. Johnson; Sgt. L. J. Jones; Sgt. T. J. Kehoe; Sgt. K. N. Killby; Sgt. G. J. Laing; Sgt. F. B. Leach; Sgt. R. M. McIntosh; Sgt. A. Marland; Sgt. R. Marlow; Flt. Sgt. C. J. Matthews; Sgt. H. Meaking; Sgt. J. L. Mitchell; Sgt. A. Moorcroft; Flt. Sgt. S. R. Moore; Sgt. D. A. Neave; Sgt. H. Newey; Flt. Sgt. L. O'Hara; Sgt. D. J. Platten; Sgt. P. D. Powell; Sgt. R. D. Proctor; Sgt. J. C. Ramsey; Flt. Lt. D. G. Redman; P/O. C. I. A. Sandland; P/O. G. E. Sankey; Sgt. R. M. Scott; Flt. Sgt. G. J. Sharman; Sgt. D. C. Smith; Flt. Sgt. D. A. R. Tallis, D.F.M.; P/O. R. H. J. Thorndyke; Sgt. W. A. Titcomb; Sgt. T. G. P. Townsend; Flt. Sgt. T. F. Trimmer; Sgt. N. F. Webber; P/O. J. D. Weir; Flt. Sgt. F. J. E. Womar, D.F.M.; Sgt. A. T. Wood; Sgt. J. W. Woolf; Sgt. L. J. Yeates.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—P/O. S. W. A. Gibbs; Sgt. D. R. Williams.

KILLED ON ACTIVE SERVICE.—L.A/C. J. A. Barnes; Act. Flt. Lt. D. J. Bell, D.F.C.; L.A/C. W. S. Bowden; W/O. J. A. Budd; Act. Sgt. A. W. Bunn; Sgt. W. R. Cooper; Sgt. W. E. Dalziel; Sgt. N. B. Day; L.A/C. C. Dobson; A/C.1 F. A. Hill; L.A/C. J. Hudson; Sgt. G. Jones; Sgt. D. H. Lennon; Sgt. G. D. Mager; Sgt. F. Morley; Sgt. H. H. Morris; Sgt. F. Payne; L.A/C. H. P. Pearson; L.A/C. R. D. Price; Sgt. G. T. A. Robins; Sgt. R. A. Roots; Sgt. J. Scholes; Sgt. L. J. Springthorpe; L.A/C. A. W. Wakely; A/C.1 J. A. Wilbinson; Sgt. A. Wheeler.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE. NOW PRESUMED KILLED ON ACTIVE SERVICE.—A/C.2 C. E. Banks; L.A/C. J. W. Dixon; A/C.1 G. Johns; Sgt. J. M. South.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. R. A. Cross; P/O. R. D. Dunscombe; Sgt. I. C. Elson; A/C.2 V. Geweiber; L.A/C. J. R. R. Green; A/C.2 W. P. Hutchinson; L.A/C. A. Mair; A/C.1 A. S. Pryor; L.A/C. R. G. Stone; L.A/C. W. H. Trinder; L.A/C. C. G. White; Cpl. H. G. Whitehurst.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. C. R. Friend; L.A/C. C. Jackson; Sgt. J. Milne; Sgt. J. L. Montagnon.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. E. Alton; Sgt. C. M. Barber; A/C.1 J. Brader; Sgt. J. D. Moller.

DIED ON ACTIVE SERVICE.—A/C.1 L. B. Allen; Cpl. L. J. Barnes; Act. Flt. Sgt. A. P. Bishop; A/C.1 H. Chambers; A/C.1 A. E. Cock; A/C.1 A. H. Davidge; L.A/C. B. H. Davies; L.A/C. N. Dyson; Flt. Sgt. O. T. Evans; Act. Sgt. I. T. Faulkner; L.A/C. H. L. Girling; L.A/C. J. A. Henham; A/C.1 K. J. Hoare; L.A/C. A. Hodson; L.A/C. L. D. Jones; L.A/C. W. S. Jones; A/C.1 I. J. Lewis; L.A/C. W. G. Lockley; L.A/C. S. H. Mitchell; A/C.1 D. W. Nelson; A/C.2 D. H. Nock; L.A/C. I. W. Orpwood; L.A/C. R. J. Power; A/C.1 A. Rabieh; A/C.1 J. W. Salt; A/C.2 D. J. Sharpe; A/C.2 E. W. Shenton; L.A/C. E. C. Titchenor; A/C.1 H. J. Turner; L.A/C. C. H. Worthington.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. W. A. Miller.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. R. C. A. Ash; Sgt. T. A. Auld; Sgt. F. Saunders.

WOUNDED OR INJURED IN ACTION.—L.A/C. M. K. Miller; L.A/C. J. H. Pile.

MISSING.—Sgt. H. R. Brodie; Sgt. A. F. Buttel; Sgt. B. H. Edye; Sgt. J. A. Gaiter; Sgt. J. R. James; Sgt. S. Levitus; F/O. W. D. Love; P/O. W. J. Mawdesley; Sgt. A. C. Schofield; Sgt. H. V. Warnock; Sgt. A. G. Welch; Flt. Sgt. M. E. Whitehill.

KILLED ON ACTIVE SERVICE.—Sgt. W. L. Carnie; Sgt. G. F. Highman; Sgt. W. D. Lynch.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. A. S. Lorimer.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. A. Steeves.

WOUNDED OR INJURED IN ACTION.—Sgt. R. A. Matthews.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. W. H. Jackson; Sgt. H. Lawton; Sgt. J. E. McDonald.

MISSING.—Sgt. D. M. Baird; Sgt. P. G. Barclay; Sgt. R. I. Derry; Flt. Sgt. J. M. Dutton; Sgt. L. H. Jones; Flt. Sgt. H. J. Kirkpatrick; Flt. Sgt. B. P. L'Hirondelle; Sgt. P. C. Leslie; Flt. Sgt. C. F. McCaw; Sgt. J. C. McPherson; Flt. Sgt. H. D. K. Macpherson; Flt. Sgt. E. F. B. Mandin; P/O. G. W. Murray; Sgt. T. J. J. Norrie; P/O. D. H. Peters; Sgt. W. F. Pickett; Flt. Sgt. R. G. Read; Flt. Sgt. W. R. Rice; Sgt. F. J. R. Scrimes; Flt. Sgt. C. H. Smith; Sgt. R. A. Smith; Flt. Sgt. T. M. Terris; Sgt. K. B. Utman; Sgt. L. A. Wadman; Flt. Sgt. E. E. Warnwick; Flt. Sgt. G. A. Welsh.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. C. Black; Sgt. C. M. Chute; Flt. Sgt. G. C. English; Sgt. W. N. Hergott; Flt. Sgt. D. B. McGregor; Flt. Sgt. W. J. Merrithew.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. L. Blatt; Sgt. R. A. Fraser.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. G. S. Brockington.

Royal New Zealand Air Force

WOUNDED OR INJURED IN ACTION.—Sgt. J. McGill-Brown.

MISSING.—Sgt. M. J. Byrne; W/O. A. J. Cowlrick; Sgt. T. E. Crarer; Sgt. D. H. Edwards; Flt. Sgt. J. E. Gilbertson; P/O. A. C. Mackenzie; Sgt. A. F. McLean.

KILLED ON ACTIVE SERVICE.—Sgt. D. Fraser; Flt. Sgt. C. T. Kronk.

South African Air Force

KILLED ON ACTIVE SERVICE.—Air Sgt. K. Diesel; Lt. L. Morkel; 2/Lt. A. E. N. Paxton.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Air Sgt. C. J. Kay.